Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Improving Public Safety Communications	)	
in the 800 MHz Band	)	
	)	
Consolidating the 900 MHz Industrial/Land	)	WT Docket No. 02-55
Transportation and Business Pool Channels	)	

COMMENTS OF CAROLINA POWER AND LIGHT COMPANY AND TXU BUSINESS SERVICES

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May 6, 2002

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SUMMARY

Sorting through the myriad of issues raised in this proceeding, there is one basic question addressed in the following Comments: Should communications networks of utility and other critical infrastructure industries be forced to turn off their systems or, if alternative frequencies that can support their systems are even available, relocate, at their own enormous expense, so that a commercial user of the band can be granted contiguous spectrum which, in addition to other commercial attributes, may help to alleviate problems of interference that this very same licensee is causing to other users in the band? The two Utilities filing these Comments emphatically answer this question "no."

The Utilities urge that effectively forcing utility and other critical infrastructure systems to cease operation in the band (one cannot operate a communications network used to help maintain the safety and security of a nuclear plant on a secondary, unprotected basis) or spend what, in the aggregate, would likely run in to the billions of dollars to try to convert their systems, if possible, to other bands is not in the public interest. Such a forced relocation of systems to accommodate an existing licensee and hand the frequencies bring vacated to that licensee (or to others as part of a more complicated trade-in scheme to give it a contiguous block of spectrum in yet another band) is unprecedented and, the Utilities urge, contrary to law.

Rather than mandate such a massive relocation of existing licensees, the Utilities urge that those causing interference in the 800 MHz band be required to modify their operations to cease doing so. Not only is such remedy already required under the Commission's rules, cellular network system entry into this part of the band was permitted based upon a clear promise by the leading proponent and would-be beneficiary of the mandatory frequency reallocation that has been proposed, Nextel, that it would not cause interference to other users of the band and that, if such interference nevertheless did arise, it would be remedied by Nextel.

So as to facilitate such efforts, the Utilities suggest that the Commission consider relaxing its rules on intercategory sharing still further so as to allow licensees to swap frequencies where necessary to solve an interference issue. Such an approach will allow those causing interference problems, and those suffering them, to determine case-by-case whether the practicality and cost of frequency relocation outweighs the cost of remedying a particular problem by a change of operating parameters at particular locations. Such an approach will also put the cost of fixing interference problems where it belongs, on those that are causing it.

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Carolina Power and Light Company ("CP&L") and TXU Business Services ("TXU") (collectively, "Utilities"), by their attorneys, hereby submit the following comments with respect to the Notice of Proposal Rulemaking (the "Notice") in the above-referenced proceeding.

I. OVERVIEW

The Utilities are gravely concerned about the proposals set forth in the Notice, both as to the specifics of the proposals and as to the more general construct that appears to be espoused. That construct appears, in a nutshell, to be that in order to solve interference problems being caused primarily by the operations of one entity, Nextel, in the 800 MHz band, this very same entity and the public safety systems to which it is causing the most interference should be permitted to divvy up frequencies heretofore licensed to utility and other I/LT, Business and non-cellular type SMR licensees. These displaced licensees would then be given the "choice" of operating on a

secondary, unprotected bases in the band or "voluntarily" and at their own expense completely rebuilding their networks and moving to other spectrum that may or may not be available to support their existing services.

Indeed, the 700 MHz band that Nextel suggests as a new "home" for displaced utility services, for which it says they should pay to move because of better interference protection,[1] is so restricted in operating conditions and frought with uncertainty regarding interference that Nextel itself say it cannot effectively use the frequencies it proposes to "donate."[2] The leading trade association for the commercial wireless industry, CTIA, said problems of interference in the band are so bad that the Commission's proposed auction of frequencies in the 700 MHz band is "asking bidders to swing blindly at a spectrum piñata,"[3] a charge the Commission barely denied, saying only that it had no choice under the statute but to go ahead with the auction.[4]

The Utilities urge that the Commission cannot[5] and should not effectively revoke existing licenses — especially those that are also used for crucial communications necessary to the nation's electric utility infrastructure, and that protect the security of nuclear and other power plants and the lives of workers and the surrounding community — by handing these frequencies over to Nextel or other licensees ostensibly as a means of resolving interference problems[6] which Nextel itself is primarily

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[1] *See* Notice ¶ 38.

[2] *See* SEC form 10-K, Annual Report for the Fiscal Year Ended Dec. 31, 2001 ("Nextel 10-K") at 21. Nextel states that the operating conditions in the band "will preclude their use for CMRS.". . Nextel goes on to point out (to its shareholders) that, "[u]nder current FCC rules [television] licenses are not required to relinquish these channels until 2006 at the earliest, limiting the usefulness of the spectrum for other purposes, including CMRS service, until that time or later."

[3] *Ex Parte*, letter from Thomas E. Wheeler, President/CEO of the Cellular Telecommunications and Internet Association ("Wheeler Letter") to Michael K. Powell, Chairman, Federal Communications Commission in WT Docket No. 99-168, GN Docket No. 01-74 ("700 MHz Docket") (Apr. 3, 2002).

[4] Letter from Thomas J. Sugrue, Chief, Wireless Telecommunications Bureau, Federal Communications Commission, to Wheeler in the 700 MHz Docket (Apr. 10, 2002).

[5] That is without affording individual hearing rights to individual licensees who would be forced to vacate spectrum and opening up the vacated spectrum to auction under Sections 303(f), 316, and 309 of the Communications Act (the "Act").

[6] How much the proposed plans are designed to alleviate interference and how much simply to grant Nextel's desire for contiguous spectrum in the band is not at all clear from the record.

responsible for creating. The Utilities also urge that any mandatory relocation must be to comparable and available spectrum with the full cost of such relocation borne by these who have caused the interference problems in the first place.

The better solution, however, to mandatory relocation, would be for the Commission to require those parties who may be causing interference to modify their operations to prevent it. Further, the Commission should consider allowing truly voluntary swaps of frequencies between and among licensees of different services where necessary to alleviate an interference problem. Particularly whereas here the problems are reported to be fairly isolated, *See* note 9 *infra*, and where the costs of remedying a problem in different circumstances might dictate different approaches, a clear mandate to remedy interference problems coupled with the right to swap frequencies voluntarily where needed to remedy a particular circumstance would appear to be all that is required and would, at the same time, be far less disruptive to other vital services that occupy the band.

Finally, the Utilities urge the Commission, in whatever action that it takes, to do so in recognition of the vital public safety role of utility communications services and the need to protect the nation's electrical power infrastructure.

II. STATEMENT OF INTEREST

TXU, through its electric utility affiliates, provides electricity to some 5.2 million persons located in over 80 counties in Texas. To provide electricity to its 90,000 square mile territory, TXU generates electricity from 24 electric generation plants and one nuclear power plant. TXU maintains over 12,800 miles of high voltage transmission lines and 67,000 miles of distribution circuits. In addition, TXU operates four mines and a 2100-mile natural gas pipeline.

CP&L, through affiliated entities, provides electricity to more than 2.7 million customers located in central and north Florida and in the Carolinas over territories that

total well more than 50,000 square miles. CP&L generates electricity for its customers from thirty-eight plants including several nuclear facilities.

Each of TXU and CP&L has invested tens of millions of dollars in land mobile systems that are vital to maintaining the reliability of their services, essential to the safety of their workers and to surrounding communities, and a crucial component of security for electric plant, including nuclear plants. They have considerable experience operating in the 900 MHz band and know how costly and time consuming a transition to that band can be. TXU alone spent 40 million dollars in a 7-year project to convert facilities to the 900 MHz band.

Businesses, homes, hospitals and schools throughout the service territories of the Utilities all rely upon dependable electricity they provide. When lines are down, extreme care must be taken at every step in the repair process. Electric utility operation and repair involve inherent dangers even in the best conditions. Lineman work within facilities charged with hundreds of thousands of volts.

Moreover, during outages, linemen often work under the poorest possible conditions. Rain, high winds, and darkness turn everyday repairs into ultra-hazardous events. Operating under these conditions requires absolute reliability of communications for efficient restoration of service, as well as for the safety of linemen and the public.

Reliable mobile communications is also an essential element of plant security, including at nuclear facilities. The health and safety of workers within these facilities and potentially persons in surrounding areas all depend on a mobile communications network that can continue to operate even if landline communications are down or wires cut. In the wake of 9/11, each company is redoubling its efforts to ensure the security of its facilities and each relies upon its land mobile communication as an essential element of this effort.

While most of the land mobile communications facilities now operated by TXU and CP&L have been transitioned outside the 800 MHz band, CP&L continues to operate an 800 MHz system at one of its nuclear power plants, both inside and outside the containment areas of the facility. The very thought that communications over this facility might be relegated to a secondary non-protected status should be frightening to anyone. Relocating that facility to another band, even assuming spectrum and equipment were available, would be costly (in the order of 1.5 million dollars) and time-consuming. Further, moving that facility to the 700 MHz band, in its current interference environment, would be a dangerous alternative at best.

TXU and CP&L are also concerned that the overall thrust of the 800 MHz band reallocation proposals before the Commission would put even greater stress on the already crowded 900 MHz band. Both companies have had already seen short-spacing proposals for internal "Business" services on I/LT frequencies (claiming a lack of available Business frequencies) that would threaten substantial interference to their operations. Forcing more users out of the 800 MHz band and into 900 MHz frequencies would only make this problem worse. Further, any possibility that additional frequencies could be obtained to expand existing networks in the 900 MHz band or to relocate facilities would in all likelihood be foreclosed. The Utilities' only choice in such a circumstance might be to turn to public networks and the risks inherent to their facilities, particularly in times of crisis when public network frequencies become jammed with traffic and essential communications cannot get through.

The Utilities are also, perhaps most of all, concerned about the precedent of a proceeding that would relegate essential utility service to secondary status to grant that spectrum to a commercial entity to meet its desire for contiguous spectrum in the band and, perhaps, address interference problems that it has itself created. Such an approach runs smack in the face of what the Commission has heretofore recognized as the vital role of secure communications networks for the nation's utility infrastructure. It suggests, long-term, a preference to push

such utility communications services into public networks that, in the Utilities' judgment, would be a mistake for ordinary utility functions and a disaster in times of crisis when clear and reliable communications for utility workers is at a premium.

III. THE BURDEN OF REMEDYING ANY INTERFERENCE PROBLEM IN THE BAND SHOULD FALL ON THOSE CAUSING IT.

This is, in many ways, an extraordinary proceeding. While labeled as a docket about "Improving Public Safety Communications in the 800 MHz Band," this proceeding appears to be most of all a docket about one specific entity, Nextel, who is at once the chief protagonist,[7] the would-be primary beneficiary, and the primary cause of the underlying interference problems sought to be remedied. Indeed, as engaging a read as Nextel's "White Paper"[8] on the interference problems is, one cannot help being reminded of the story of the child who, having murdered his parents, pleads with the court for mercy because he is an orphan.

Thus, while Nextel makes much of the fact that its operations are within licensed technical parameters, it remains the case that it is the changes that it (and potentially other cellular type architecture systems)[9] have made in their network architecture that have caused interference to public safety systems in the band.[10] Nextel (and the public

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[7] While, apparently in response to Nextel's proposal, a second joint proposal was submitted by the National Association of Manufacturer ("NAM") and MRFAC, Inc., *See* Notice ¶ 19, most of the Notice addresses issues raised by Nextel's proposal and that is also the focus of these Comments.

[8] "Promoting Public Safety Communications – Realigning the 800 MHz Land Mobile Radio Band to Rectify Commercial Mobile Radio – Public Safety Interference and Allocate Additional Spectrum to Meet Critical Public Safety Needs," Nov. 21, 2001 (cited in Notice ¶ 13 n. 38).

[9] Whether interference problems have emanated from any other network or, even if so, whether these are anything more than isolated, remediable circumstances, is unclear. As the Commission has recognized, Nextel's use of the non-cellular portion of the 800 MHz band for a digital cellular system serving the public at large puts it virtually in a licensee-class of its own. *See* Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, 15 FCC Rcd 17660, 17689 and n.185 (2000) (the "2000 Competition Report").

[10] Thus, Nextel has reported to its shareholders: "Different types of SMR licensees successfully coexisted for many years, but changes over the past few years to network architecture necessary to support commercial digital technology have created isolated, intermittent situations. . . of interference." Nextel 10-K at 16.

safety entities to which it is causing interference) are already under an obligation under Section 90.173(a) of the rules to cooperate to resolve these problems of interference, failing which the Commission already has the power to "impose restrictions including specifying the transmitter power" or specifying other operating conditions to require that such harmful interference be eliminated.

Although the record makes clear that some effort has been made on the part of Nextel and other affected licensees to remedy the interference problems that have occurred, it is anything but clear, much less established, in the record that more could not be done, either by way of Nextel reducing the power it places on the ground from individual transmitters, or otherwise filtering its transmissions, or by public safety entities adding transmitter locations or otherwise making their mobiles more resilient to interference. Such efforts would of course come at some cost, presumably to be borne by Nextel (and/or, if applicable, other CMRS carriers operating cellular type systems in the band who may be causing interference), but there is no indication that such costs would be anything approaching the cost to I/LT and other licensees of relocating out of the band to address what Nextel has described as "isolated, intermittent situations" of interference.[11]

It must be recognized, moreover, that Nextel's proposed solution for interference, clearing out the band of I/LT, Business and other non-CMRS cellular systems, to give it contiguous spectrum would have other enormous economic benefits to Nextel, letting it overcome the last technical hurdles to its creation in the 800 MHz band effectively of another cellular allocation. So Nextel reports to its shareholders:

> The availability of a significant block of contiguous spectrum would permit the introduction of a broader range of technology options than is available to us on non-contiguous spectrum blocks. In connection with future deployment of 3G technologies, we have completed tests to assess the operational and commercial feasibility of constructing and

[11] *Id.* at 16.

> launching an overlay network using the 3G CDMA2000 technology, on up to an average of 10 MHz of contiguous spectrum in nearly every major market in the United States. Additionally, we continue to pursue regulatory initiatives that would provide us with rights to create and use other contiguous blocks of spectrum.[12]

Any suggestion that what is involved in Nextel's proposal before the Commission is just an altruistic effort to remedy interference to public safety and not a grab for already licensed frequencies is belied by such discussion.

It is also the case that the interference problems which Nextel is now encountering are very much of its own making, going back to the very introduction of its cellular-type system into frequencies that had already been allocated and licensed for other purposes. As set forth in the Notice, frequencies in the 800 MHz band were originally allocated so as to establish two commercial cellular systems in one part of the band and private and compatible single base station-designed SMR dispatch-type operations in the other part of the band.[13] Nextel (and its predecessor-in-interest, Fleet Call) then, through extensive waiver relief,[14] followed by further waivers and rulemaking actions in which Nextel was the chief proponent,[15] and primary ultimate beneficiary,[16] convinced the Commission to allow the introduction of what it has

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[12] *Id*. at 14.

[13] Notice ¶¶ 6-10.

[14] Fleet Call, Inc., 6 FCC Rcd 1533 (1991) ("Fleet Call"). From this initial waiver grant, thousands of waivers (most of which were granted to Nextel, affiliated entities, or entities it has acquired) followed. *See* Nextel Communication, Inc., 13 FCC Rcd 281 (WTB 1998).

[15] *See* Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, 11 FCC Rcd 1463, 1503-10 (1995) ("800 MHz Wide Area Decision") (much to the resistance of incumbent licensees, at Nextel's urging, the Commission forced incumbents -- other than the auction winner(s) -- out of the upper part of the band, to make available blocks of spectrum at auction). Then Nextel convinced the Commission to waive its rules regarding intercategory sharing so that Nextel could move incumbent licensees to frequencies in other parts of the band, *see* Nextel Communications, Inc., 14 FCC Rcd 11678 (WTB 1999) (the "Nextel Swap Waiver"), which decision was later followed, in response to still broader waiver relief requested by Nextel, by a change in the rules which allowed private systems to be converted to commercial operation and thus incorporated into Nextel's network. *See* Implementations of Section 309(j) and 337 of the Communications Act of 1934 as Amended 15 FCC Rcd 22709, 22725 (2000) ("Spectrum Efficiency R&O").

[16] In the 800 MHz SMR General Category Auction (No. 34), Nextel paid $231 million of the $319 million in total bids. Of the 1,030 licenses represented by that sum, Nextel captured a distinct majority. Likewise,

proudly and successfully marketed as a third cellular system in the part of the band that had been originally designed and licensed for non-cellular use.

This Nextel-led transformation of what once had been an allocation exclusively for private and small dispatch use to one more and more dominated by Nextel's cellular-type system, has been premised on assurances by Nextel that its new use of the band would not create problems of interference, especially for public safety systems. Thus, in the engineering statement that accompanied Fleet Call's original waiver request (portions of which are attached for ease of reference), Fleet Call asserted that its lower "ESMR" (as Fleet Call called its proposal service) base station heights would cause less co-channel and less adjacent channel interference than traditional SMR systems.[17] Ironically, Fleet Call asserted that "because of the lower ESMR base station heights, ESMR services represent a lower adjacent channel interference than existing SMR[18] service. Fleet Call, in fact, went to great pains to emphasize that it would protect public safety systems in the band from interference:

> FCI recognizes and supports the special status the Commission accords to public safety licenses engaged in activities affecting the safety of life and property. Public safety systems should be accorded full and continuing protection.[19]

On the subject of interference, Fleet Call concluded:

Nextel paid nearly $89 million of the $96 million in total bids in the 800 MHz SMR Upper 200 Channels Auction (No. 16) in which 525 licenses were auctioned. By contrast, participants in the 2 GHz Broadband PCS A and B Block Auction (No. 4) paid over $7.7 billion. (*See* auction Public Notices DA-2037, (rel. Sep. 6, 2000); DA 97-2583, (rel. Dec. 9, 1997); and PNWL 95-28, (rel. Mar. 13, 1995)).

[17] Fleet Call, Inc., Waiver Request, Appendix A, at A-8 through A-13, *See* Private Radio Bureau Seeks Comments on Fleet Call's Request for Rule Waiver, FCC Public Notice 2665 (rel. Apr. 12, 1990).

[18] *Id*, Appendix A at A-12.

[19] *Id.* at 33 (of main waiver request) (emphasis added). When later the Commission moved toward geographic licensing in the 800 MHz band, the Commission at first proposed that tighter emission masks be imposed to protect spectrum adjacent to wide area CMRS systems in the band. Nextel, however, resisted such changes as an unnecessary constraint on the flexibility of wide area licensee and in the end the Commission largely backed down from such restrictions. 800 MHz Wide Area Decision, at 1518-1520.

> As demonstrated above, ESMR service can be implemented without interference to existing SMR stations (or other 851-869 MHz stations). Furthermore, very conservative assumptions were used in the analysis above providing an extra interference buffer to existing stations and proposed ESMR stations. It is therefore believed that any actual interference experienced in the six congested markets from ESMR service will be limited to isolated cases. Because of the flexibility of the ESMR service, such isolated cases of interference can be resolved by utilizing a number of frequencies, reducing power or height, re-orienting or changing directional antennas, or employing electrical or mechanical beam tilt.[20]

It is one thing to make such a promise; apparently another to make good on it.

Nextel has, through its creative use of the non-cellular-allocated portion of the band, extensive waiver relief, and extraordinary influence in shaping the rules that govern the band, made itself into a nationwide, multibillion dollar communications giant, a worthy competitor to cellular and PCS licensees.[21] It has managed to accomplish this feat in a part of the band never allocated for this purpose and, although it has obviously had to pay significant amounts for acquiring systems and encumbered 800 MHz spectrum, without having to pay for anything like the prices for spectrum that it would have had to pay for PCS or cellular licenses.[22]

It now turns out that some of Nextel's analysis as to the non-interfering nature of its cellular network design vis-à-vis public safety and potentially other users of the band appears to have been overstated. Nextel itself concedes that its system design, unlike other more traditional uses of the band, has created the interference problem.[23] It should then be Nextel's responsibility and, if it is the case, the responsibility of any other similarly-situated CMRS cellular digital network carrier that may be causing interference to clean up the problem that has been created.

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[20] Fleet Call Waiver Request, Appendix A, at A-13 (emphasis added).
[21] *See* 2000 Competition Report at 17666-68, 17689.
[22] *See* note 16 *infra*.
[23] Nextel 10-K at 16.

IV. THE COMMISSION CANNOT AND SHOULD NOT FORCE LICENSEES TO VACATE THEIR LICENSED FREQUENCIES SO THAT SUCH FREQUENCIES CAN BE AWARDED TO ANOTHER PARTY WITHOUT A HEARING AND WITHOUT MAKING THE VACATED FREQUENCIES AVAILABLE FOR COMPETING APPLICATIONS.

The essence of the band restructuring proposals being put forward to the Commission is that I/LT and, in some cases, other licensees in the 800 MHz band would be forced out of the band,[24] "voluntarily" to move, at tremendous expense to other spectrum, if even available, to make way for another party, Nextel, to use their frequencies. The Utilities urge that such a forced "voluntary" relocation to make way for another party — even one that has volunteered $500 million to help in the relocation — cannot be made without giving the adversely affected licensees hearing rights under Sections 303(f) and 316 of the Act. Further, if such licensees are forced off the band, this must open up the vacated frequencies to competing applications under Section 309 of the Act. Thus, while the Notice cites other instances in which the Commission has required licensees to relocate to other bands to open up the frequencies for the licensing of systems employing new technologies,[25] or, pursuant to the military affairs exemption of the APA, to avoid interference to a military satellite,[26] none of the cases cited suggest that the Commission has the power, without giving rise to hearing rights under Sections 303(f) and 316 of the Act, to clear a channel, much less a large chunk of a band, to give the frequencies to another already specified commercial entity.

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[24] Nextel's suggestion that utilities might remain in the band in a "secondary basis" is of no help. *See* Notice ¶ 35. As soon as Nextel moves its systems in, the utilities will have to move out. Critical communications cannot operate on a secondary basis.

[25] *See* Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, 7 FCC Rcd 6886, 6887-6891 (1992).

[26] Amendment of the Commission's Rules to Relocate the Digital Electronic message Service from the 18 GHz Band to the 24 GHz Band, 13 FCC Rcd 15147, 15156-57 (1998). The DEMS decision was premised on the military affairs exception to the APA, *Id.* at 15150, and, therefore, does not support the notion that "merely" reducing a licensee to secondary status would not, in normal circumstances, give rise to hearing rights, as suggested in the Notice, particularly where, as here, secondary status would make continuing operation in the band practically impossible. *Compare* California Citizens Band Association v. United States, 375 F.2d 43, 50-52 (9th Cir. 1967), *cert. denied*, 389 U.S. 844 (1967) ("California Citizens Band") (while changing required silent period from two to five minutes did not require hearing rights, the court cautioned that its decision should not be read "to imply that the Commission could make drastic changes in … licenses without a public hearing … under Section 303(f)").

The underlying principle supporting the Commission's general rulemaking authority in the cases cited in the Notice stems from the Supreme Court's decision in United States v. Storer Broadcasting Co.,[27] in which the Court upheld the power of the Commission, through rulemaking proceeding, to issue rules of general applicability, even if such rules effectively mean that a pending license application could not be granted. The Storer decision has been followed by the courts in numerous cases where agency rulemaking has affected individual license rights, evolving into a basic principle that agencies have the power to promulgate rules of general applicability even where the effect is to modify individual licensee rights without a hearing.[28] More recently, the Commission followed this line of cases to support its reassignment of certain frequencies from the Special Emergency Radio Service to the Emergency Medical Radio Service, holding that the effect of such change on certain licensee rights does not implicate Section 316 of the Act as long as no individual license holders are singled out.[29] Here, by contrast, the proposals before the Commission would single out existing licensee(s) and especially one, Nextel, for special benefits. Even if the Commission were ultimately to conclude that such benefits were deserving in the public interest, the Commission does not have the authority to make such a determination without an adjudicatory hearing.

The same underlying problem of attempting, through a general rulemaking proceeding, to force the transfer of frequencies from one group of licensees to another specified entity (or entities) also creates an Ashbacker[30] problem, not just for the "new" licenses Nextel seeks in the 2 GHz band, but for the licenses it proposes to obtain by forced license "swapping" arrangements. Thus, set against the general Ashbacker principle that vacant channels must be made available for competing application, an

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[27] United States v. Storer Broadcasting Co. 351 U.S. 192 (1956) ("Storer").
[28] *See*, *e.g.*, California Citizens Band at 47-49; Upjohn v. Food and Drug Administration, 811 F.2d 1583, 1584-85 (D.C. Cir 1987); American Airlines v. Civil Aeronautics Board, 359 F.2d 624, 625 (D.C. Cir. 1966), *cert. denied*, 385 U.S. 843 (1966).
[29] Amendment of Part 90 of the Commission's Rules to Create the Emergency Medical Radio Service, 11 FCC Rcd 1708, 1710 (1996).
[30] Ashbacker v. U.S., 326 U.S. 327 (1945) ("Ashbacker").

exception has developed under which the Commission has permitted licensees voluntarily to exchange frequencies without exposing their licenses to competing application.[31] The basis for these channel swap decisions is that the relevant frequency rights are already held by individual licensees and, therefore, simply allowing such licensees voluntarily to exchange frequencies should not "open" up either frequency to general application.[32] In essence, because only two licensees are involved, a public process for assigning frequencies among all interested parties is not required. As explained by the D.C. Circuit, the swap policy: "allows the Commission to implement the will of private parties with minimal imposition of FCC requirements. Private parties, rather than the FCC, initiate the exchange."[33]

In total contrast, however, if the Commission seeks to exercise its general rulemaking authority to modify the rights of existing I/LT or other license holders, it cannot, in the same instance, hold that because only the rights of individual license holders are at stake, the frequencies forced to be vacated do not have to made available, under Ashbacker, for application by third parties. The plans before the Commission do not involve a voluntary channel swap or, indeed, in Nextel's plan any "swap" at all. Rather, utility and other licenses would be forced off their spectrum (or forced into secondary status which would for most be effectively the same thing) to free up spectrum for other licensees to move in. There is nothing in the "swap" cases or the Act that would even suggest that this can be accomplished without making the vacated spectrum available for competing application.

That one of the goals of the proposal before the Commission may be to alleviate interference to public safety systems caused by Nextel's operations cannot justify a licensing shortcut that would deny existing licensees and potential new applicants their

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[31] *See* Amendments to the Television Table of Assignments ("TV Channel Swap Policy"), 59 Rad. Reg. (P&F) 2d 1455 (1986).
[32] *Id.* ¶¶ 28-29 (the Commission analogized the situation to that of an application for assignment of license, where third party applications for the same facilities are not considered).
[33] Rainbow Broadcasting Company, 949 F.2d 405, 408 (1991).

rights under the Act. Indeed, actual or alleged interference between or among licensees is a common issue of concern. But it would lead to the potential for extraordinary abuse and the gutting of statutory protections were individual licensees allowed to use such interference problems (especially when their own practices are the primary source of the interference) to justify the taking of spectrum rights from other licensees.[34]

V. ANY MANDATORY RELOCATION MUST BE TO COMPARABLE AND AVAILABLE SPECTRUM; THOSE ADVOCATING RELOCATION TO ANOTHER BAND SHOULD BE WILLING TO RELOCATE THEIR OWN FACILITIES TO IT.

Even in those cases where the Commission has determined that existing licensees must be relocated in frequency to clear spectrum for new technologies and services, the Commission has gone to great length to ensure that primary licensees in the band who are being displaced are not moved until and unless comparable spectrum and facilities can be made available to them. Thus, when incumbent licensees were forced out at the upper 800 MHz channels to make room for Nextel (and other EA auction winners), the EA licensees were required to build a replacement system for the incumbent licensees being displaced, having "comparable facilities," which the Commission defined to include: the same functionality; the same number of channels; the same bandwidth (or, if not, the same overall capacity in terms of signaling capability, band rate, access time); geographic coverage that is co-extensive with the coverage of the frequencies being replaced; the same quality of service, including vis-à-vis interference protection; and the

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[34] By way of example in the television channel assignment context where most of the major precedent has developed, it is well known that Channel 6 stations suffer interference from educational FM operations in the surrounding area. In response to this interference problem, special provisions have been made in the rules that provide, among other things, economic incentives for the educational FM stations to alleviate interference problems. *See* 47 C.F.R. § 73.525(b). This rule was enacted after years of debate to address this interference problem that existed despite different licensees each of which was operating within licensed parameters. *See* Changes in the Rules Relating To Noncommercial, Educational FM Broadcast Stations, Third Report and Order, 57 Rad. Reg. 2d (P & F) 107 (1984) *clarified by* Changes in the Rules Relating To Noncommercial, Educational FM Broadcast Stations, Memorandum Opinion and Order, 58 Rad. Reg. 2d (P & F) 629 (1985). There was never a suggestion in that proceeding, however, could that a permissible solution would have been for the affected licensees, either those causing or those suffering interference, to relocate to another already-licensed television or FM allocation and displace other television or FM licensees.

same operating costs (or the difference to be made up by the EA licensee).[35] Similar requirements for comparable facilities were also imposed when microwave licenses were forced to relocate to make way for new PCS licensees.[36]

Here, by contrast, the proposals before the Commission to move I/LT licenses out of the 800 MHz contain no guarantee of comparable or necessarily even available or usable spectrum to replace the frequencies that would be lost. Putting aside the obvious differences in the bandwidth of the channels that might be offered in the 700 and 900 MHz bands, there is no assurance that frequencies (especially in the 900 MHz band) will even be available for license in the areas at which facilities will need to be replaced.[37]

The suggestion that the 700 MHz band will be just as good, no Nextel says better interference protection than in the 800 MHz band, is ludicrous. As discussed above, Nextel itself points to the additional restrictions[38] on operations in the 700 MHz band and interference in the band from broadcast incumbents as making the band practically useless for its own operations.[39] Frequencies in the band have been available for licensing to public safety systems since 1998[40], with little or no activity. The wisdom of the Commission's proposed auction of commercial frequencies in the band, given the enormous problems of interference and the cloud of uncertainty created by the need still to clear the band of broadcast operations, has been severally questioned by the commercial wireless industry.[41] And, now the U.S. Department of Commerce itself has asked the FCC to postpone its auction of 700 MHz band frequencies for the same

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[35] *See* 47 C.F.R. § 90.699.
[36] *See* 47 C.F.R. § 101.75.
[37] The NAM plan to relocate the 800 MHz band is clearly less problematic with regard to the issue of comparable spectrum. But how such a shifting of frequencies could be accomplished within an already crowded band without a continuing daisy chain effect is entirely unclear. Further, the costs of changing out frequencies, while much less if facilities stay in the same band and channel bandwidth allocation, would still be substantial.
[38] *See* 47 C.F.R. § 27.60.
[39] *See* Nextel 10K at 21.
[40] Service Rules for the 746-764 and 776-794 MHz Bands, 15 FCC Rcd 476 (2000).
[41] *See* Wheeler Letter.

reasons.[42] How, under these circumstances, Nextel can even suggest that the 700 MHz will provide a better environment that is more secure from interference for I/LT or other licensees who should, it says, pay to be given the opportunity to relocate to the band is hard to imagine.

An equal exercise in unreality is Nextel's suggestion that licensees in the band be given as little as a year to relocate their frequencies to other bands. There is, to the Utilities' knowledge, little equipment available for purchase for operation in the 700 MHz band, to which no one thus far has found a practical way to use. As for a move into the 900 MHz band (that is, assuming available channels and equivalent capacity), TXU's experience is that it took nearly seven years and 40 million dollars to relocate its networks to 900 MHz operations. Time and cost are also, of course, related. If the burden of paying for a frequency relocation and ensuring the availability of facilities were on these who are demanding such action, then their view of practical timing (as well as the practical feasibility of relocation) might change. While the Utilities understand the need for prompt action, the fastest way to remedy the problem is not to force a massive relocation among several bands, but to make those who are causing the interference stop doing so.

Finally, if the 700 MHz or 900 MHz band is really such a good solution for 800 MHz licensees, than those advocating relocation of frequencies in the band should be the first to "volunteer" to relocate there to solve the interference problem that they have created or are experiencing. That plans are being submitted to require other licensees to relocate, who are neither the cause nor at least at this point the primary recipient of the interference that has been identified, should debunk on its face the notion that such relocation is somehow a benefit to those who would be forced out of the band.

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[42] Letter from Donald L. Evans, Secretary, U.S. Department of Commerce to The Honorable W.J. "Billy" Tauzin, Chairman, Committee on Energy and Commerce, House of Representatives (May 2, 2002).

VI. THOSE CAUSING THE INTERFERENCE PROBLEM IN THE 800 MHZ BAND SHOULD BEAR THE FULL COST OF ANY MANDATORY RELOCATION AND ENSURE THE AVAILABILITY OF COMPARABLE SPECTRUM.

Even if the Commission concludes that it can and should mandate the relocation of I/LT or other licensees to permit Nextel to have contiguous spectrum in the band, it should require Nextel (and, if applicable, any other entities who would be permitted to succeed to the vacated spectrum) to guarantee the availability of comparable spectrum and facilities necessary for the displaced licensees to change frequencies and pay the full cost of any such required modification. Such costs should include, at a minimum, all of the costs that EA licensees are required to reimburse when moving incumbent licensees out of the upper portion of the 800 MHz band.[43]

While no one individual entity or group of entities can have sufficient information to know how much such relocation will cost in the aggregate, Nextel's "offer" to contribute $500 million to the relocation efforts appears woefully inadequate and its suggestion that I/LT licenses could relocate at "a minimum cost" is without foundation.[44] To the contrary, from the Utilities' own experience in such frequency relocation, they regard ARINC's estimate of costs in the billion of dollars as a far more accurate estimate.[45] But whatever the cost, there should be no cap on the amounts to be reimbursed as suggested in the Notice,[46] because it is not within the Commission's power to limit the actual costs to be incurred. If it turns out that Nextel is right, and the costs are "minimal" then it should be willing to pay them. If, on the other hand, the cost of such relocation goes into the billions, then placing this cost on those who have created the problem and who advocate band relocation to solve it might lead them to a different solution in which costs can be better managed and in which the parties to any proposed mandated relocation can be fairly compensated.

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[43] 47 C.F.R. § 90.699.
[44] Notice ¶¶38-41, n. 106.
[45] *See* Notice ¶44.
[46] Notice ¶32.

It is nothing short of outrageous for Nextel to suggest that I/LT, Business, and conventional SMR systems should pay for such voluntary relocation because they will somehow benefit from it, removed from the threat of interference — from Nextel?, in the friendly confines of the 700 MHz or 900 MHz bands.[47] There is absolutely no evidence to support the assertion that that operation in such bands would be less susceptible to interference. Indeed, as discussed above, the problem of potential interference is so great in the 700 MHz band that Nextel and other CMRS operators cannot effectively use the spectrum. As for the 900 MHz band, there are already problems of tightly spaced facilities. The spectrum that Nextel proposes to contribute to a relocation does not match what it proposes to remove from the 800 MHz band. To cram more and more services into the band will only exacerbate problems in the band.

We know of no I/LT or other licensee who wants to change frequencies to accommodate Nextel's plans or who would regard it as a benefit. On the other hand, if Nextel is correct that such licensees would view such relocation with favor, then it already has the means to implement it. Thus under Section 94.621(e) of the rules, Nextel can, through arms' length negotiation, acquire frequency licenses from private operators, and it also can secure spectrum for the relocation of these licenses either through the 700 MHz or by 900 MHz frequencies it claims it already has for such frequency exchanges.

VII. THE COMMISSION CAN MAKE CHANGES TO ITS RULES THAT FACILITATE SWAPPING ARRANGEMENTS TO ALLEVIATE INTERFERENCE WITHOUT MANDATING FREQUENCY RELOCATION.

While the Utilities urge the Commission not to mandate the relocation of licensees to solve Nextel's interference problem and grant its longstanding wish for a contiguous block of spectrum in the 800 MHz band, the Utilities believe that the Commission can and should consider modifying its rules to allow for swaps of spectrum between licensees in the 800 MHz band where necessary to solve an

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[47] *See* Notice ¶35.

interference problem. Such an approach would then mirror the Commission's television assignment swapping policies.[48] It would allow, but not mandate swaps to alleviate interference issues.

Such a policy would also avoid the need for the Commission to measure the costs of relocation or assess whether the frequencies to which licensees might be relocated really constitute comparable spectrum. Instead, the affected licensees themselves would make this determination. Such an approach would also allow the affected parties to determine, case by case, whether a more efficient solution would be to remedy the interference problem in the band or pay for a licensee to move to other frequencies that are acceptable to the licensee.

Such an approach of permissive channel relocation could be implemented in line with the procedures adopted by the Commission in the Nextel Swap Waiver and Commercialization of Private Systems decisions. Among other things, a certification should be required from all participants to any swap that the exchange is being made to alleviate interference between systems[49] and a holding period should be required to ensure that systems are not licensed just to be relocated.[50]

In addition to these measures, the Utilities urge the Commission to change its technical rules to make explicit the duties of cellular type systems operating in the band to modify their operations, if not initially, at least in response to any *bona fide* interference complaint to limit the interference potential of their systems to no more than more traditional operations in the band. In the regard, the Utilities understand that other commenting parties may be submitting proposed technical standards to accomplish the result, which the Utilities intend to address in reply comments in this proceeding.

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[48] *See* TV Channel Swap Policy.
[49] *Compare* Nextel Swap Waiver at 11691 (certification required as to purpose of swap).
[50] *Compare* 47 C.F.R § 90.621(e)(ii) (to be eligible for conversion to commercial operation, private licenses must have been held for five years).

VIII. COMMUNICATIONS NECESSARY TO MAINTAIN AND PROTECT THE NATION'S CRITICAL UTILITY INFRASTRUCTURE SHOULD NOT BE JEOPARDIZED

A basic policy goal set forth in the Notice is that problems of interference in the 800 MHz band should be resolved, "consistent with minimum disruption to our existing licensing structure and assurance of sufficient spectrum for critical public safety communications."[51] The Utilities fully support this goal. At the same time they urge that the band restructuring proposals that have been submitted for comment under the Notice, especially the Nextel proposal, serve neither goal.

There would under Nextel's proposal be massive disruption to already licensed and critical utility communications services. They would become "secondary" in the band they operate and left to "voluntarily" look for spectrum in other bands, spectrum which Nextel itself finds inadequate for its own use. Even if adequate spectrum could be found, displaced licenses would be subject to costs potentially aggregating in the billions. The reshuffling proposed by NAM in the 800 MHz band, while less expensive, if workable at all, also promises substantial service disruption and costs, as licensees might have to relocate over and over again in a daisy chain effect, as each move requires another. Subjecting utility and other critical infrastructure and public safety licensees to such massive disruption to solve interference problems created by commercial operations in the band is not in the public interest and would jeopardize public safety. In this regard, the Commission has recognized that utility and other critical infrastructure communications networks "provide essential services to the public at large and they need reliable communications in order to prevent or respond to disasters or crises affecting their service to the public,"[52] and, therefore, especially in today's times,[53] are necessary to the "public safety."[54]

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[51] Notice ¶2.

[52] Spectrum Efficiency R&O at 22717.

[53] *See*, *e.g.*, "Summary of The President's Executive Order: The Office of Homeland Security And The Homeland Security Counsel," U.S Newswire (Oct. 8, 2001) (noting that increased diligence is required to

Communications systems necessary to support this nation's critical utility infrastructure must not be jeopardized to satisfy the desire of a commercial licensee for contiguous spectrum or to allow it to escape from its obligation and promise to remedy interference that it is causing to other licensees in the 800 MHz band, especially public safety.

Respectfully submitted,

CAROLINA POWER & LIGHT COMPANY
AND TXU BUSINESS SERVICES

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May 6, 2002

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protect "energy production, transmission, and distribution services and critical facilities"); Statement of FCC Chairman Powell Following Tour of New York Telephone Facilities and Discussion of Repair Efforts With Telephone Officials (rel. Sept. 20, 2001) (noting "how essential it is to consumers and businesses alike to have their damaged or destroyed lines operational as soon as possible").

[54] Spectrum Efficiency R&O at 22717.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Fleet Call, Inc.	)	File No.
	)	
	)	
For Authority to Assign SMR Licenses and Waiver of Certain Private Radio Service Rules	)	

To The Commission:

FLEET CALL, INC.

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Date: April 5, 1990

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
	)	
Fleet Call, Inc.	)	File No.
	)	
	)	
For Authority to Assign	)	
SMR Licenses and Waiver of	)	
Certain Private Radio	)	
Service Rules	)	

I. INTRODUCTION

Fleet Call, Inc. and its subsidiaries (FCI) hereby respectfully request Federal Communications Commission (Commission) approval of their applications for assignment of licenses and for waivers of specified Commission Rules and Regulations to authorize the creation of Enhanced Specialized Mobile Radio (ESMR) systems in six of the most frequency congested land mobile communications markets in the country. The markets are Chicago, Dallas, Houston, Los Angeles, New York and San Francisco (the "markets" or the "congested markets").

FCI's ESMR systems will use digital land mobile communications transmission technology in a low-power, multiple base station configuration to provide approximately fifteen times more user capacity than is now available on existing Specialized Mobile Radio (SMR) systems in the congested markets

without any additional spectrum allocations for this service. Given that existing 800 MHz SMR facilities in the congested markets are at virtual capacity, these ESMR systems will enable FCI to meet the growing demand for both voice and non-voice private land mobile communications services. FCI is not requesting additional spectrum to provide ESMR service; rather, it is effectively creating additional spectrum capacity for the private land mobile service by increasing the amount of communications that can be provided on the frequencies currently authorized to it.

The ESMR concept represents a natural evolution to the next generation of SMR service. Fleet Call's efforts meet the challenge of most effectively utilizing an increasingly scarce resource, the spectrum. Approval of the requested applications and rule waivers is consistent with the Communications Act of 1934, as amended, the Commission's Rules and Regulations and the public interest. Accordingly, FCI respectfully requests that the Commission grant the authorizations necessary to implement ESMR systems in the congested markets, as discussed below.

ESMR system would accept and engineer frequency use around existing co-channel and adjacent-channel licensees and would continue to afford them the same interference protection the Commission's Rules currently provide.42/

2. Interference Protection -- ESMR Geographic Area

FCI proposes to offer ESMR service in geographic areas defined by the demographics of each congested market. The boundaries of each ESMR system take into account a variety of factors including: current mobile communications demand; predictions of future demand; the optimum location of base stations to provide coverage; existing FCI licenses; availability of tower site locations; effective radiated power

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[FOOTNOTE CONTINUED FROM PREVIOUS PAGE]

from an existing co-channel licensee. The necessary mileage separation may be different depending on the effective radiated powers of ESMR base stations, local terrain and propagation characteristics. In every case, however, the ESMR system will protect existing co-channel licensees from interference for at least a 20-mile service area as discussed in more detail in the Engineering Statement.

42/ The Commission's Rules do not provide adjacent channel interference protection to SMR stations and such interference has not been a significant problem in the SMR service. The ESMR systems, which represent a lower adjacent channel interference potential because of their low power design, need not provide such protection to existing facilities. A minimum mileage separation of 16 miles will be observed, however, to protect the ESMR systems from adjacent channel SMR stations. See Engineering Statement at p. 12.

levels of base stations and mobile units in a lower powered multiple base station system; local terrain and propagation characteristics; and existing adjacent and co-channel systems. These factors are then used to define an ESMR Geographic Area (EGA) which will afford the interference protection needed to buffer the lower-powered ESMR multiple base station system from neighboring systems operating under current configurations.43/

FCI emphasizes that each low power, multiple base station ESMR system must be protected from interference created by neighboring systems operating in the traditional single site, high power configuration. Such systems are much more likely to cause interference to the ESMR system than they are to receive harmful interference from the lower power ESMR operations. Establishing sufficient interference protections to allow the ESMR system to function as designed is critical to its success in providing substantially increased user capacity and enhanced service offerings.

Accordingly, FCI requests that the ESMR system in each congested market be accorded interference protection as follows. First, each current SMR primary base station location

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43/ The maps delineating the exact EGAs for each of the six markets are included in Attachment C. The EGAs are limited to the actual protection areas required by each ESMR system. The EGA boundaries have been designed as latitudinal and longitudinal straight lines, rather than irregular boundaries, for ease of administration by the Commission.

to be assigned to Smart SMR would continue to receive 70 mile co-channel interference protection (or greater protection at certain sites in California as specified in Section 90.621(b) of the Rules) for the channels licensed at its current coordinates even though these current facilities will be replaced by the new low power sites and different channels could be constructed there.44/ Thus, applications for new and/or modified non-ESMR facilities outside the EGA boundary would be evaluated in terms of the existing co-channel mileage separation criteria of Section 90.621(b) of the Rules. If the proposed co-channel site is outside the EGA and more than 70 miles (or as specified in Section 90.621(b) for certain California sites) from the listed "traditional" SMR base station coordinates, it can be processed without further regard to the ESMR system. If the site is within the EGA, however, a new or modified co-channel or adjacent channel system could not be authorized, as discussed further below.

Second, FCI requests waivers of Sections 90.135(a)(5), 90.117, 90.119(a)(3) and Section 1.911 of the Commission's Rules to allow it to construct and operate additional low power base stations within the EGA without the need for Smart SMR to submit, and the Commission to approve, each new facility within

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44/ As noted above, the consolidated license would continue to list all frequencies as currently authorized including primary site coordinates.

the EGA. It will be necessary to refine and modify the ESMR frequency use plan periodically to incorporate additional base stations or channels at a given site for system expansion, as well as to assure high quality service and maximum system capacity. FCI requests that these waivers enable it to construct and operate such additional sites with notice to the Commission, but without requiring prior approval of each new or modified low power site.45/

In other words, Smart SMR would be authorized to construct additional base stations, to move existing base stations, to modify its frequency assignments, and to otherwise "fine-tune" or expand the ESMR system within the EGA without prior Commission approval of each such action.46/ No site requiring

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45/ As noted previously, Attachment A includes the preliminary frequency plan of the Los Angeles and San Francisco systems. These waivers would allow Smart SMR to add or otherwise modify the base station locations without prior approval provided, of course, that existing non-ESMR systems remain protected.

46/ Section 90.7 of the Commission's Rules, 47 C.F.R. § 90.7, defines "land mobile radio system" as "A regularly interacting group of base, mobile and associated control and fixed relay stations intended to provide land mobile radio communications service over a single area of operation." The Commission could issue each ESMR system a single consolidated "land mobile radio system" license for its EGA pursuant to Section 90.7, authorizing Smart SMR to modify and expand the ESMR system as described above. This would satisfy the requirements of Section 90.113 that no transmitter be operated in the services governed by Part 90

[FOOTNOTE CONTINUED ON NEXT PAGE]

either FAA clearance or an environmental assessment would be constructed without complying with the Commission's requirements; i.e., FCI is not seeking a blanket waiver of either Section 17.7 (FAA clearance) or Section 1.1307 (environmental assessment) of the Commission's Rules for each ESMR system. The relief requested would allow FCI to respond to changes in user demand without burdening the Commission's limited processing resources.47/

Finally, FCI recognizes its obligation to accept interference from existing co-channel systems and that it must not cause interference to such systems. FCI requests, however, that it not be required to protect or accept interference from

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[FOOTNOTE CONTINUED FROM PREVIOUS PAGE]

except as authorized by the Commission. This approach would only require a waiver of Section 90.117 (requiring an application to add a new station to a land mobile radio system or to modify a station that is part of the system) to accomplish the requested result.

47/ The Commission uses a similar regulatory scheme in the Domestic Public Cellular Mobile Radio Telecommunications Service. See Section 22.903 of the Commission's Rules, 47 C.F.R. §22.903. A cellular licensee has three years to provide service to at least 75 percent of the land area of the Cellular Geographic Service Area (CGSA) in each market. Thereafter, cellular licensees have an additional two years to expand their CGSAs up to the geographic limits of the MSA without being subject to competing applications. A cellular licensee may change or add a cell site without prior Commission authorization so long as the reliable service area remains within its CGSA. See Section 22.9 of the Commission's Rules. Similarly, FCI proposes that it be authorized to modify its base stations within the EGA without prior Commission approval.

new or modified systems within the EGA for which applications are not pending as of the date of Commission action on this application. In other words, while FCI can design the ESMR system to account for the existing RF environment, new systems and their operating parameters cannot be anticipated.

An unrestrained, chaotic RF environment within the EGA would necessitate constant re-engineering of the ESMR system to the detriment of its users. For these reasons, FCI requests that applications for new and/or modified non-ESMR co-channel or adjacent channel facilities within the EGA that were not filed prior to the date of favorable Commission action on this application, or from any potential "strike" applicant, not be granted.48/ During the pendency of this matter, FCI requests that the Commission monitor applications for systems within the EGA borders to determine if the filings are for the purpose of thwarting the proposed ESMRs.

Notwithstanding the above, FCI recognizes and suppports the special status the Commission accords to public safety licensees engaged in activities affecting the safety of life and property. Public safety licensees should be accorded full and

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48/ As described in the Engineering Statement in Attachment A, the ESMR channel reuse plan is designed to account for and prevent co-channel and adjacent channel interference. The efficient design of the ESMR system would be seriously compromised by the authorization of new co-channel or adjacent channel traditional SMR systems within the EGA.

continuing protection. Accordingly, FCI believes that these licensees should not be subject to the restrictions on intra-EGA, non-ESMR co-channel and adjacent channel facilities. These public safety licensees are adjacent to less than 5% of FCI's SMR frequencies. Therefore, this would not seriously hinder the development of the ESMR system.

In its recent decisions affirming the use by the County of San Bernardino, California of frequencies offset from regularly assignable channels for its county-wide public safety communications system,49/ the Commission required the County to resolve any interference to existing licensees and to accept any interference from such existing licensees or future users of such existing facilities. The Commission excluded from protection, however, new base stations and their users stating that, while it is possible as a practical matter for the County to engineer in against existing facilities, it cannot engineer in against unknown stations.50/

FCI seeks the same type of treatment regarding applications for new or modified co-channel and adjacent channel facilities

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49/ Request for Waivers of Part 90 of the Commission's Rules by the County of San Bernardino to Operate a County-Wide Public Safety Communication System is the 800 MHz Band, 2 FCC Rcd 6721 (1987)(PRB Order), 3 FCC Rcd 6033 (1988)(San Bernardino Order), aff'd., 4 FCC Rcd 3830 (1989)(San Bernardino Reconsideration Order).

50/ San Bernardino Order at 6034.

(other than public safety) within the defined EGA. FCI can engineer against known existing facilities; it cannot, however, anticipate and cannot engineer against new or modified co-channel or adjacent channel facilities. Therefore, FCI, in its efforts to provide more efficient technology, should not have to either accept interference from such facilities or protect them.

As the above discussion indicates, FCI requires only limited regulatory action to establish the interference protection criteria necessary to fully realize the benefits of ESMR technology. Providing 70-mile co-channel protection from FCI's existing SMR base station facilities outside the EGA will protect the low-power ESMR system from high-power co-channel operations. Maintaining the stablility of the RF environment within the EGA will enable FCI to continue providing co-channel and adjacent channel licensees within the EGA interference protection equivalent to that required by Section 90.621 of the Commission's Rules, as discussed in the Engineering Statement in Attachment A. This will allow the ESMR system to be designed to produce maximum user capacity without creating or experiencing harmful interference.51/

51/ As discussed earlier, the congested markets have generally been fully authorized for SMR usage for several years. Thus, existing SMR systems within the EGA have had ample opportunity for system development.

This limited relief will not harm or modify the authorizations of existing licensees and thus requires no further proceedings under Sections 309 and 316 of the Act.52/ Nor will it preclude legitimate traditional SMR applicants from obtaining non-ESMR channels from the pool of 800 MHz and 900 MHz SMR channels still available in each area. It will, however, eliminate the threat of new interference problems during the development of the ESMR system. An innovation which will yield a fifteen fold increase in efficiency without additional spectrum allocations warrants this relief.

3. Statutory and Policy Considerations

The relief from the current SMR regulatory requirements described above is consistent with the Communications Act as well as Commission policy and precedent. Implementation of ESMR service would further the Congressional mandate of Section 303 of the Communications Act that the Commission should " . . . encourage the larger and more effective use of radio in the public interest." Similarly, Section 7(a) of the Communications Act, 47 U.S.C. § 157(a), added by Public Law 98-214 in 1983, states:

52/ See San Bernardino Order at 6034. There the Commission concluded that authorizing the County's public safety radio system did not modify existing licenses because the County was required to protect the existing licensees from interference. FCI's ESMR system would also protect existing licensees, as discussed above.

ATTACHMENT A

1. Engineering Statement, prepared by Moffet, Larson and Johnson, Inc., providing a detailed explanation of the technical parameters of Enhanced Specialized Mobile Radio (ESMR) Systems.
2. Preliminary ESMR system designs for Los Angeles and San Francisco.

The two system design maps depict the initial service areas for the Los Angeles and San Francisco ESMR systems. The maps graphically illustrate the multiple, low-power base station configuration that allows FCI's existing frequencies to be reused many times in each market to increase system capacity while not causing interference to existing co-channel and adjacent channel licensees. The smaller base stations in the more highly urbanized areas indicate more intensive frequency reuse to provide greater system capacity for these higher demand areas. The service areas are based on the demographics of each market taking into account, among other things, current and projected mobile communications demand, local terrain and propogation characteristics and existing adjacent and co-channel land mobile radio systems.

Fleet Call, Inc.
Enhanced SMR

ENGINEERING STATEMENT

I. INTRODUCTION

1. Moffet, Larson & Johnson, Inc. (MLJ) has been retained by Fleet Call, Inc. (FCI) to prepare this Engineering Statement. MLJ is a consulting engineering firm with a long history of professional service to the telecommunications industry. MLJ was founded in 1952 by John A. Moffet, Sr. (d. June 1983) who was a Senior Partner in the predecessor firm, Silliman, Moffet & Roher. Wallace E. Johnson, a registered engineer in the District of Columbia and the Commonwealth of Virginia, became a Principal of MLJ in May 1982. For 37 years, he was employed as an engineer by the Federal Communications Commission and was Chief of the Broadcast Bureau from August 1971 to May 1979. He has served as Executive Director of the Association of Broadcast Engineering Standards (ABES) since June 1979. He also serves on the FCC/Industry Radio Advisory Committee and is Chairman of the Technical Sub-Group. Mr. Johnson succeeded Mr. Moffet as President of MLJ in June of 1983. J. Barclay Jones is a Senior Engineer and a member of the Board of Directors of MLJ where he has been employed since March 1979. Mr. Jones has extensive experience in the design and evaluation of cellular telephone systems, microwave systems, Instructional Television Fixed Service (ITFS) systems, Multichannel Multipoint Distribution Service (MMDS) systems, Low Power Television (LPTV) stations, full service TV stations, Educational FM stations, commercial FM stations, and AM stations. MLJ is a member of many industry organizations including AFCCE, CTIA, NAB and Telocator.

II. ENHANCED SMR

2. Current SMR systems use high-powered analog transmissions and high antenna heights to provide dispatch and interconnected mobile communications in service areas generally less than 35 miles in radius. Cochannel frequencies cannot be re-used within 70 miles (105 miles from 4 peaks in southern California and according to Section 90.621(b)(2)(ii) in northern California) without short-spacing agreements. The use of analog transmissions (F3E) and the resulting restriction on frequency re-use limits the capacity and features that current SMR systems can offer.

3. FCI proposes a new technology for private land mobile telecommunications, Enhanced SMR (ESMR), which will operate on FCI's currently licensed analog SMR frequencies. ESMR will increase subscriber capacity at least fifteen fold through the use of low-powered digital transmissions and low antenna heights at multiple base stations, re-using cochannel frequencies within 9.33 miles (or closer). ESMR will be controlled through central switching facilities which will allow for uninterrupted hand-off between base stations of calls in progress and will be fully interconnected to the landline network. The ESMR technology will provide an array of dispatch services and features not available with the current analog technology. The digital ESMR technology will bring a new level of quality, security, flexibility and capability to the private land mobile radio services.

Fleet Call, Inc.
Enhanced SMR

III. DIGITAL TECHNOLOGY

4. Digital ESMR technology uses available spectrum more efficiently than current analog technology. For each current 25 kHz analog voice channel, digital ESMR can provide 3 voice circuits with an equivalent RF bandwidth of approximately 8 kHz each, using a Time Division Multiple Access (TDMA) architecture. In a TDMA architecture, a single frequency is divided in time so that three mobiles use the same frequency but do not transmit in the same time slot. TDMA architecture has been adopted as the standard for U.S. digital cellular systems[1] and European digital cellular systems[2] and has been successfully demonstrated in field tests by International Mobile Machines Corporation (IMM)[3].

5. The bandwidth necessary for a digital voice circuit is determined by the voice coding, channel coding and modulation schemes employed. The 8 kHz equivalent bandwidth proposed for ESMR is achievable using currently available technologies. Recent breakthroughs in voice coding technology have produced voice coders (vocoders) that provide "telephone quality" encoded voice signals with bit rates as low as 8 kbps. The U.S. digital cellular standard specifies a voice coder output rate of 7950 bits per second (7.95 kbps). These hybrid vocoders use linear predictive coding (LPC) with an excitation source[4]. The output of the vocoder is further encoded (channel coding) to protect the speech coder data and to allow for forward error detection and correction[5]. The modulation scheme then determines the number of bits carried by each transmitted symbol.

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[1]The U.S. digital cellular standards are described in the interim standard; IS-54 "Dual-Mode Mobile Station - Base Station Compatibility Standard" prepared by the EIA/TIA TR-45.3 Subcommittee on Digital Cellular Systems, EIA/TIA project number 2215.

[2]The European digital cellular standards were specified by the Groupe Special Mobile (GSM) of the Conference Europeen des Administrations des Postes et des Telecommunications (CEPT).

[3] D. Ridgley Bolgiano, International Mobile Machines Corporation, 38th IEEE Vehicular Technology Conference, Philadelphia, PA June 1988.

[4] The U.S. digital cellular standard specifies Vector-Sum Excited Linear Predictive Coding (VSELP) which is a variation on Code-Excited Linear Predictive Coding (CELP) that uses codebooks to vector quantize the residual signal. The European digital cellular standard specifies Regular Pulse Excited Linear Predictive Coding (RPE-LPC). Other linear predictive coding schemes include Multi-Pulse Excited Linear Predictive Coding (MPE-LPC) and Residual Excited Linear Predictive Coding (RELP).

[5]The U.S. digital cellular standard specifies three channel coding mechanisms to mitigate channel errors. First, a convolutional coder is used to protect the most vulnerable bits of the speech coder data stream. Second, the transmitted data for each speech coder frame is interleaved over two time slots to mitigate the effects of Rayleigh fading. Third, a cyclic redundancy check (CRC) verifies that some of the most perceptually significant bits of the speech coder were received correctly.

6. FCI proposes a 4-level phase shift keying (PSK) modulation such as the pi/4 shifted differentially encoded quadrature phase shift keying ($\pi/4$-DQPSK) modulation specified in the U.S. digital cellular standard. Non-coherent detection is necessary unless an absolute phase reference can be obtained (possibly from the control channel). A 4-level modulation scheme carries two bits per symbol which reduces the bandwidth that would be necessary for a 2-level (binary) modulation scheme. The 4-level modulation scheme also reduces the complexity of the demodulator that would be necessary for a 16-level modulation scheme. Thus, the 4-level modulation scheme selected balances the necessary bandwidth against a robust signal that will allow ESMR to be implemented using existing technologies.

7. Imminent breakthroughs in voice coding technologies are expected that will make "telephone quality" vocoders available with bit rates as low as 4.8 kbps. FCI is not relying on these advances to implement ESMR. Such breakthroughs will, however, eventually allow ESMR to provide 4, 5 or 6 digital voice channels for every 25 kHz analog voice channel. Due to trunking efficiencies, doubling the number of digital voice channels per analog voice channel more than doubles the overall ESMR system capacity. For purposes of the system capacity analysis provided below, 3 digital channels for every analog channel is assumed. FCI has every reason to expect, however, that technological advances will allow a much greater overall system capacity than that determined below for 3 slot TDMA. Furthermore, because of the flexibility of the TDMA architecture, upgrading from a 3 slot TDMA system to a 6 slot TDMA system can be achieved without major modifications to the ESMR system.

8. Analog transmissions are inherently more susceptible to interference than digital transmissions. Low levels of interference can cause perceptible degradation in analog signal quality. Digital transmissions can tolerate higher levels of interference without voice quality degradation and thus allow frequencies to be re-used within closer distances. The net effect of greater spectrum efficiency and greater resistance to interference is more channels that can be re-used more often.

9. Digital ESMR offers a higher level of voice security than is currently available from analog SMR systems. Anyone with a tunable receiver (such as a scanner), can eavesdrop on analog SMR transmissions. It will, however, require a much greater level of sophistication to eavesdrop on a digital TDMA transmission.

10. Digital ESMR can also provide vehicle location information that can be vital to 911 emergency calls and extremely useful to dispatch customers. By identifying the specific sector antenna of the specific base station location that has a radio link with a given mobile, that vehicle's approximate location can be determined. More efficient dispatch services can be offered in which only those mobiles in the fleet (sub-fleet) that are closest to a specific location are called by the dispatcher. A great range of services can be offered to dispatch customers because of the availability of vehicle location information in digital ESMR.

11. Digital ESMR can offer high speed data transmission with greater reliability than current analog SMR. FCI expects ESMR to meet a growing

demand for this service as the use of portable fax machines, laptop personal computers and other non-voice machines becomes more widespread. As ESMR technology is introduced, mobile modems will appear on the market to service the demand for reliable high speed data transmissions. Modems offering a 1200 baud rate should be on the market very shortly after the initiation of ESMR service. Modems with higher rates up to 9600 baud should follow shortly.

12. There are areas within the general service areas of existing SMR stations where service cannot be provided. These services "holes" are generally due to shadowing by severe terrain obstructions, high concentrations of buildings or interference from neighboring systems. By utilizing multiple low powered base stations, the proposed ESMR system can effectively fill-in these existing service holes. ESMR base stations can be positioned to "look into" areas currently obstructed by severe terrain features. In areas of high building concentrations, ESMR base stations can be positioned atop buildings to provide adequate local service through direct path and multipath reflections off neighboring buildings. ESMR can offer relief to areas currently receiving interference from neighboring systems by utilizing different frequencies at the base stations located in these areas. The system design engineer seeking to improve service to the public within the service area has a great deal more flexibility with ESMR than with the current analog SMR system.

13. Another advantage of a digital transmission is the ability to detect, re-generate and re-transmit a "clean" signal. When an analog signal is received and re-transmitted, the noise is amplified as well as the desired signal. As an analog signal cascades down a series of re-transmissions, the additive nature of the noise floor very quickly degrades the quality of the desired signal to an unacceptable level. Digital re-transmissions, however, do not accumulate noise. At each re-transmission, the received signal is detected and a "fresh copy" is re-transmitted effectively stripping the noise accumulated on the last transmission path. This feature makes certain techniques available to digital ESMR not available to analog SMR. For example, providing ESMR service in a tunnel utilizing "leaky coax", like the Andrew Radiax, becomes feasible even over great distances such as in subway tunnels.

14. The digital ESMR technology proposed by FCI provides greater system capacity than analog SMR by providing more channels that can be re-used more closely. Furthermore, digital ESMR provides greater flexibility than analog SMR because of the advancing technology of processing, manipulating and storing digital information. Digital ESMR also allows for integration into the emerging ISDN digital network that is not possible with analog SMR.

IV. FREQUENCY RE-USE

15. ESMR base stations will use effective radiated powers (ERPs) and antenna heights comparable to cellular base station sites. The cellular base station heights and powers are compatible with frequency re-use plans discussed below. Furthermore, because manufacturers have developed inventories to handle the cellular equipment demands, towers, transmission

lines and antennas for ESMR base stations with these heights and powers are readily available. Therefore, FCI anticipates maximum ERPs of 100 watts and antenna heights approximately 200 feet above ground.

16. Cellular operators are allowed a maximum ERP of 500 watts at an antenna height above average terrain (HAAT) of 500 feet. For the dense urban areas for which FCI proposes ESMR, just as in cellular systems, these cellular maximums are not compatible with the intensive frequency re-use that is required to service the anticipated demand. In most cases, ESMR base stations with small service radii will use powers and heights significantly below these maximums. The base stations will utilize three 120° sector antennas to minimize interference potential.

17. FCI expects ESMR system design to have the following basic parameters. ESMR base stations will be selected from hexagonal closest packed grids. The Level 1 grid will have a distance between base station locations of 14 miles. See Figure 1. Frequency re-use will be from an N=4 pattern making the distance between Level 1 cochannel base stations 28 miles. The N=4 pattern can be determined by setting i = 2 and j = 0 in the following relationship[6]:

$$N = i^2 + ij + j^2 \quad \text{where } i,j \text{ are integers and } i >= j$$

To increase subscriber capacity, Level 2 ESMR base stations will also be implemented from a hexagonally closest packed grid overlaying Level 1 in a "corner split" configuration. See Figure 2. The distance between Level 2 base station locations will be 8.08 miles. The N=4 frequency re-use pattern will continue to hold, making the distance between Level 2 cochannel base stations 16.17 miles. Finally, Level 3 ESMR base stations will be implemented from a hexagonally closest packed grid overlaying Level 2 in a "corner split" configuration. See Figure 3. The distance between Level 3 base station locations will be 4.67 miles. The N=4 frequency re-use pattern will continue to hold, making the distance between Level 3 cochannel base stations 9.33 miles. These grids sizes and the N=4 re-use plan are appropriate for the 3 slot TDMA quaternary PSK modulation and the height-power limitations selected[7].

18. Theoretically, corner splitting to ever smaller and smaller grid levels is possible -- infinitely increasing system capacity. As a practical matter, interference limitations, base station costs, real-estate availability and other factors limit the number of times grids can be corner split. Corner splitting to grid Level 3 is within these practical limitations.

19. In order to assign ESMR frequencies to a base station location, all the 851-869 MHz channels were tabulated into 12 frequency groups. From

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[6]V. H. MacDonald, "The Cellular Concept", The Bell System Technical Journal, January 1979, Vol. 58, No. 1.

[7]Some literature supports an N=3 re-use pattern. See George Calhoun, "Digital Cellular Radio", Artech House, 1988 chapter 9, page 252. The N=4 re-use pattern utilized for the system capacity determinations below is more conservative than an N=3 re-use pattern.

this complete list, the non-SMR frequencies were excluded leaving the following table:

CHANNEL GROUPS

A1	B1	C1	D1	A2	B2	C2	D2	A3	B3	C3	D3
								201	202	203	204
205	206	207	208	221	222	223	224	225	226	227	228
241	242	243	244	245	246	247	248	261	262	263	264
265	266	267	268	281	282	283	284	285	286	287	288
301	302	303	304	305	306	307	308	321	322	323	324
325	326	327	328	341	342	343	344	345	346	347	348
361	362	363	364	365	366	367	368	381	382	383	384
385	386	387	388	401	402	403	404	405	406	407	408
409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432
433	434	435	436	437	438	439	440	441	442	443	444
445	446	447	448	449	450	451	452	453	454	455	456
457	458	459	460	461	462	463	464	465	466	467	468
469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492
493	494	495	496	497	498	499	500	501	502	503	504
505	506	507	508	509	510	511	512	513	514	515	516
517	518	519	520	521	522	523	524	525	526	527	528
529	530	531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550	551	552
553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576
577	578	579	580	581	582	583	584	585	586	587	588
589	590	591	592	593	594	595	596	597	598	599	600

An ESMR base station assigned channels from the A group, for example, would utilize the A1 channels in the sector oriented at 0° True, the A2 channels in the sector oriented at 120° True and the A3 channel in the sector oriented at 240° True. Frequency grouping in this way maximizes the frequency separation between channels in the same sector that have to be combined into the same antenna. If a given cell has more channels available than are necessary to meet the demand in its service area, channels can be "borrowed" by a neighboring cell that requires additional channels to meet the demand in its service area. Channel borrowing may be important for ESMR systems because of the potential for uneven cochannel and adjacent channel preclusion across the channel groups.

20. System control channels will vary from system to system. In addition to other overhead information, the system control channels will transmit the system control channel list. When powered on, or when entering an ESMR system, a mobile unit will scan a prescribed subset of channels to identify and lock onto the strongest control channel. The mobile unit then enters the ready mode from which the mobile can identify itself to the ESMR system to request a voice channel or respond to a page. From the overhead information available on the control channel, the mobile unit obtains and retains the system control channel list. Further control channel scanning will be confined to the control channel list so obtained. This list will be retained until the mobile is powered off or until the mobile leaves the system.

21. The "soft" control channel list described above allocates voice and control channels more efficiently than dedicating certain channel to be control channels in all ESMR markets. If the control channels were predetermined, many potential voice channels would have to be permanently set aside for control purposes to ensure than enough control channels were available in every ESMR market. The "soft" control channel list therefore, maximizes the number of available voice channels by minimizing the number of control channels to those actually necessary to operate the ESMR system. Allocating voice and control channels efficiently maximizes the overall system capacity.

22. The emission designator for 3 slot TDMA digital PSK voice transmissions in the existing 25 kHz channel bandwidth is 25K0G7E. In addition to telephony, data transmissions and ancillary signaling to control hand-off, mobile power, etc. are proposed. The emission designator for these transmissions is 25K0G7D. The single emission designator, 25K0G7W, covers the combination of these transmissions and therefore is believed to be the appropriate emission designator for ESMR. Section 90.207 does not specifically authorize G7W emissions. However, Section 90.207(a) does authorize single channel analog telephony emissions (G3E) to include tone signals or signalling devices whose sole functions are to establish and to maintain communications. Section 90.207 does authorize single channel digital voice modulation (G1E) emissions for other Part 90 services (Fire, Police and Power Radio Services). Those G1E authorizations are construed to include authorization to use single channel data transmissions (G1D) subject to Section 90.233. The G7W authorization requested for ESMR differs from these authorized emissions only in that ESMR will use TDMA architecture to increase capacity.

V. INTERFERENCE

23. The current 70 mile SMR restriction on frequency re-use was originally determined by the FCC to allow for an interference free service area of radius 20 miles. This was determined assuming a 40 dBu service contour calculated from the F(50,50) TV curves for channels 14-83 de-rated by 9 dB. For trunked and urban-conventional systems, the maximum allowed ERP is 1 kw and the maximum allowed HAAT is 1000 feet (for HAATs in excess of 1000 feet, the ERP must be reduced according to Table 2 of Section 90.635). For these urban systems, an additional de-rating factor was included to account for the effects of "urban clutter" on signal propagation. Suburban-conventional systems have a lower maximum ERP of 500 watts and a lower maximum HAAT of 500 feet (for HAATs in excess of 500 feet, the ERP must be reduced according to Table 2 of Section 90.635). For these suburban systems, no additional de-rating factor was necessary. The service areas determined by the FCC to be afforded interference protection was (and remains) 20 miles. It is clear from Sections 90.635(b) and (c) that the service area to be protected by FCC rules is 20 miles. These Sections provide for ERP reductions to be used by licensees whose service area requirements are less than 20 miles.

24. To protect the 20 mile SMR service area, the FCC allowed 50 miles for the 30 dBu contour calculated from the F(50,10) TV curves for channels 14-83 de-rated by 9 dB (no additional urban-clutter factor was used in the interfering contour calculation to provide an additional

interference protection buffer). Thus the desired to undesired signal strength (carrier to interference or C/I) ratio used by the FCC was 10 dB. A 10 dB C/I ratio means that the interfering signal must be 10 dB lower (or 1/10 the power) of the protected signal.

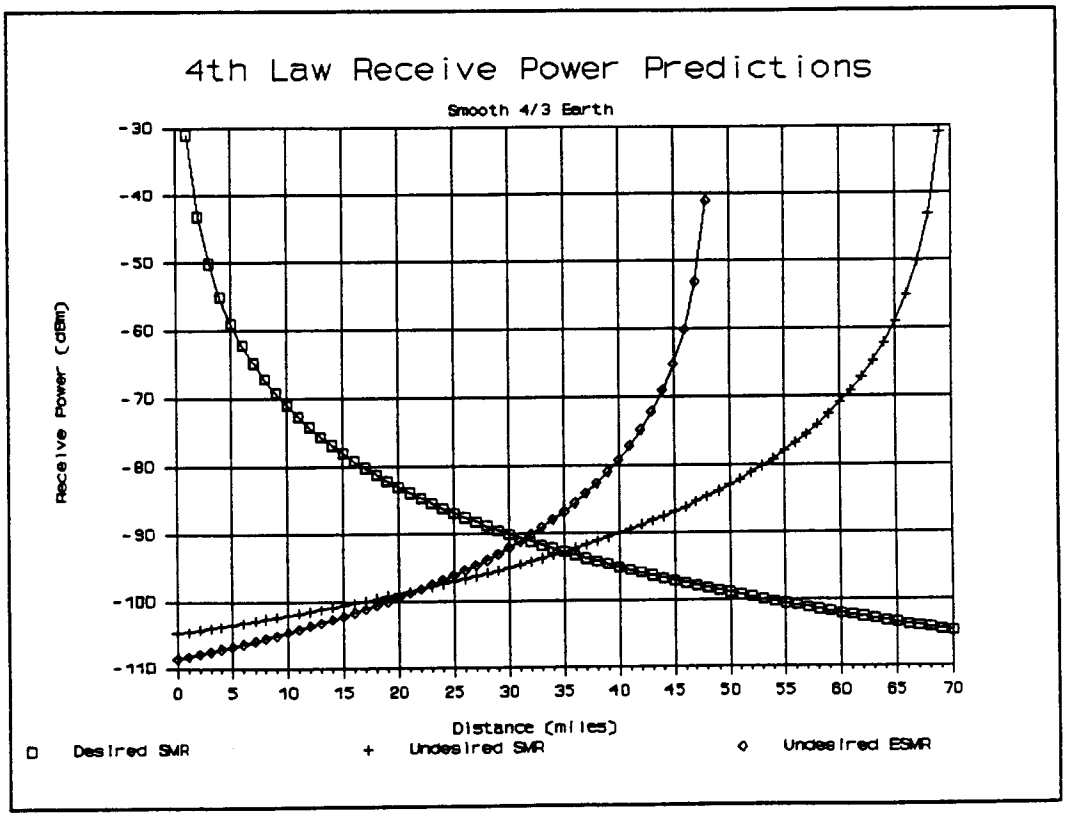
25. It is recognized that in many cases, existing SMR systems may be providing service beyond a 20 mile radius. Particularly in California, where the 70 mile rule is not applicable in all cases, the existing SMR service area radii may be substantially greater than 20 miles. In order to determine the level of interference protection to be provided to existing SMR stations, an alternate propagation analysis has been performed on hypothetical maximum facility trunked SMR stations separated by exactly 70 miles. In a free space path loss model, receive power diminishes as the inverse square of the distance from the transmitting antenna. In real world mobile environments, however, actual propagation losses are much greater than those predicted by a simple free space inverse square path loss model. Accounting for terrain, buildings, vegetation and atmospheric effects, a model based on the inverse of distance to the fourth power (4th Law propagation model) is a more realistic prediction of actual propagation path losses. A 4th Law propagation model has been utilized for this alternate analysis. A detailed, terrain sensitive propagation model developed by Philip Rice, a recognized expert in propagation theory, has been utilized to verify the results of the 4th Law analysis. Mr. Rice is the co-author of the National Bureau of Standards Technical Note 101 "Transmission Loss Predictions for Tropospheric Communications Circuits" and numerous other propagation models[8].

26. The TV curves utilized for the FCC 70 mile cochannel separation determination are based on an "average" amount of terrain roughness. In the markets proposed for ESMR, in many cases, protected stations will not be terrain shielded from potentially interfering stations. In other words, there are cases where mobiles can receive unobstructed signals from both the desired and undesired stations. There are, of course, cases where terrain shielding helps protect desired stations. However, because of the high transmitting antenna heights of other operating SMR stations, there will be cases of interference from distant interfering stations. Therefore, a smooth earth with a K factor of 4/3 has been assumed for the 4th Law propagation analysis.

27. ESMR frequency use has been designed to provide the equivalent protection to cochannel SMR stations as currently provided by the FCC Rules. As seen below, an undesired 1000 watt SMR station located 70 miles from a desired 1000 watt SMR station provides a C/I ratio of 17 dB at the 20 mile protected service area boundary. An undesired 100 watt ESMR facility located 48 miles from the desired SMR provides equivalent protection to the desired SMR's service area as the 70 mile spaced 1000 watt SMR. As a practical matter, since ESMR base station heights are significantly lower than SMR base station heights, the 4th Law propagation and smooth earth assumptions overpredict ESMR interfering signals more

[8]Other terrain sensitive propagation models are available to verify the results of the 4th Law and Rice Model analyses provided below. See William C. Y. Lee, "Mobile Cellular Telecommunications Systems", McGraw-Hill Book Company, 1989, Chapter 4.

than the SMR interfering signals. Since ESMR transmitting antennas are lower, there will be less fresnel clearance and more terrain and man-made obstructions of ESMR signals than SMR signals. Therefore as a practical matter, reducing the cochannel mileage separation to an SMR station from an ESMR station from 70 miles to 48 miles provides greater protection to



the SMR than is currently provided under the FCC Rules. However, for purposes of the capacity determinations described below, a worst case 48 mile cochannel mileage separation has been assumed.

28. The 48 mile cochannel separation provides adequate protection to existing SMR stations which are afforded 105 mile protection under Section 90.621(b)(1) of the FCC Rules. A "real world" example has been analyzed using the Rice Model described above[9]. Mt. Wilson, in the greater Los Angeles area, is one of the southern California peaks provided 105 mile protection. Furthermore, an ERP of 1 kw is allowed at Mt. Wilson despite the HAAT in excess of 1000 feet (footnote 2 of Table 2 Section 90.635(c)). Potential interference to a Mt. Wilson SMR station from a hypothetical ESMR base station in the Laguna Hills area has been analyzed using the Rice Model. The hypothetical ESMR base station in the Laguna

[9]Further information on the Rice Model is available to the Commission upon request.

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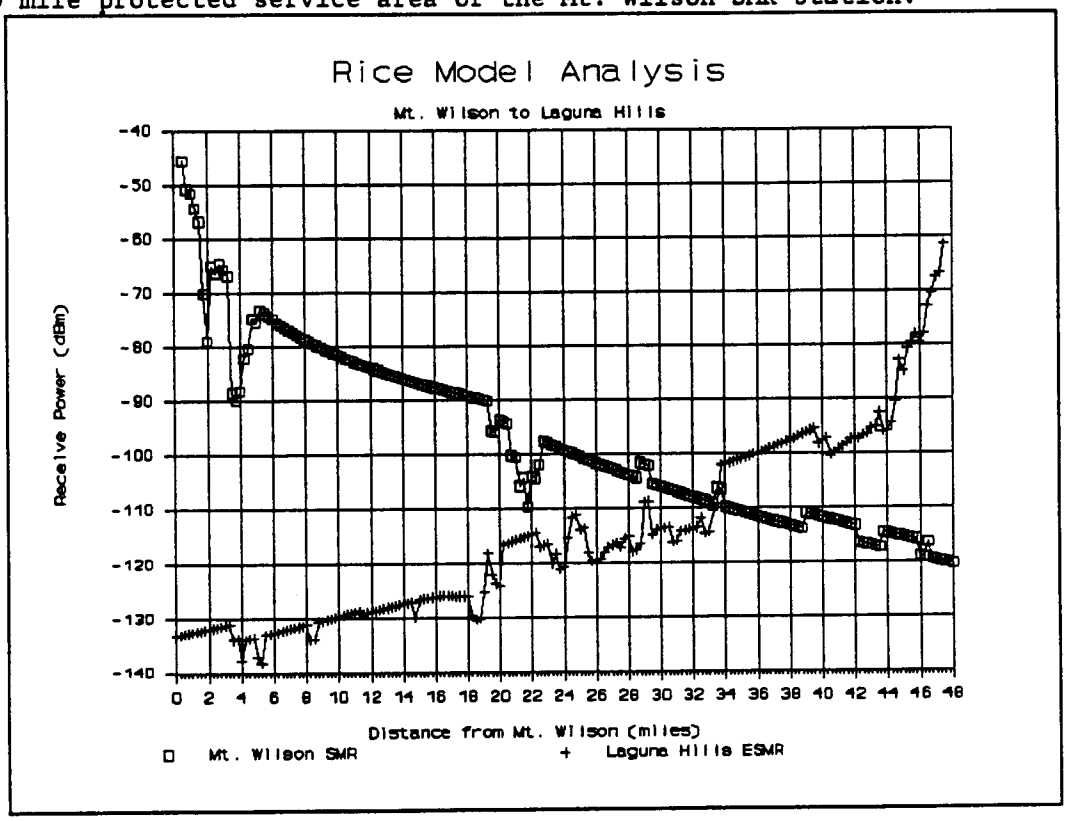
Enhanced SMR

Hills area is located 48 miles at an azimuth 155.444° True from Mt. Wilson. As seen below using this terrain sensitive model, the hypothetical ESMR base station provides a C/I ratio well in excess of 10 dB within the 20 mile protected service area of the Mt. Wilson SMR station.



29. FCI expects to utilize frequencies without causing interference to existing cochannel SMR stations. This non-interference showing can be made by adhering to a mileage separation or by providing a C/I greater than 10 dB throughout the existing SMR service area as demonstrated using an appropriate terrain sensitive propagation model such as the Rice model described above.

30. ESMR service areas need to have interference protection from cochannel SMR stations. In order to provide "telephone quality" service, 3 slot TDMA with a 4-level PSK ESMR service requires a cochannel C/I ratio of 10 to 12 dB. The 48 mile separation determined above is sufficient to provide the necessary C/I ratio for high quality interference-free ESMR service.

31. The current FCC Rules do not provide adjacent channel interference protection to SMR stations. The operational experience of FCI and other SMR operators is that adjacent channel interference is not a significant problem in the SMR service. ESMR transmissions will be contained within the authorized bandwidth by specifying that the total

emission power in either adjacent channel will be at least 26 dB below the mean output power on the desired channel. The total emission power in either second adjacent channel will be attenuated by at least 45 dB below the mean output power. The total emission power in any other 25 kHz band shall not exceed -43 dBw or be attenuated by at least 60 dB below the mean output power whichever is the higher power level. Because the maximum ESMR base station ERPs are 10 dB below the maximum SMR ERPs, and because of the lower ESMR base station antenna heights, ESMR service represents a lower adjacent channel interference potential than existing SMR service. Therefore, no adjacent channel interference protection to existing SMR facilities from the ESMR service is required.

32. ESMR service areas, however, need to have some interference protection from adjacent channel SMR stations. It is believed that in order to provide "telephone quality" service, 3 slot TDMA with a 4-level PSK ESMR service will require an adjacent channel C/I ratio of -10 dB. For purposes of the capacity determination described below, an adjacent channel mileage separation of 16 miles has been assumed. This is the minimum separation a maximum facilities adjacent channel SMR can be located to provide the necessary -10 dB C/I ratio for high quality interference-free ESMR service.

33. There is little likelihood of interference to SMR stations from ESMR mobiles. Section 90.635(d) authorizes an output power of up to 100 watts for SMR mobiles. It has been the operational experience of FCI that the majority of SMR mobiles operate with 35 watts output power. It is anticipated that ESMR mobiles will operate with approximately 7 watts maximum output power. Therefore, SMR mobiles transmit with at least 7 dB more power than ESMR mobiles. Assuming that the SMR mobile will operate within 20 miles of the SMR transmitter, that an ESMR base station is separated from the cochannel SMR stations by 48 miles and that the maximum service radius of an ESMR station is approximately 8 miles, the SMR mobile will be 20 miles closer to the SMR base station than the potentially interfering ESMR mobile. Under 4th Law propagation assumptions, the received signal at the SMR base station from the SMR mobile will be at least 19 dB higher than the received signal of the undesired ESMR mobile. Therefore, the ESMR mobile will not interfere with the SMR base station.

34. Similarly, the ESMR base station will be adequately protected from interference from SMR mobiles by the 48 mile cochannel separation. Although the SMR mobile transmits with a signal at least 7 dB stronger than the ESMR mobile, the ESMR mobile will be 20 miles closer to the ESMR base station than the interfering SMR mobile. This assumes that the SMR mobile operates within 20 miles of the SMR base station and that the maximum ESMR service radius is approximately 8 miles. Assuming 4th Law propagation, the received signal at the ESMR base station from the ESMR mobile will at best be only 7 dB higher than the received signal of the undesired SMR mobile. As a practical matter, however, 4th Law assumptions underpredict the attenuation from a distant mobile unit because of the low antenna heights (a few feet above ground). The additional 20 miles of mobile separation should be adequate to guarantee that the SMR mobile will not interfere with the ESMR base station. Furthermore, the ESMR base station can use electrical or mechanical beamtilting to reduce the gain of received signals from distant sources. By downtilting receive antennas, ESMR base stations will be maximizing the received signals from desired ESMR mobiles while minimizing received signals from other undesired (SMR

and other ESMR) mobiles.

35. FCI has developed the concept of the Enhanced Geographic Area (EGA) to define the area in which ESMR service is to be provided and to buffer ESMR service from interference. FCI proposes to retain the cochannel mileage separations from its SMR facilities that will be replaced by ESMR base stations. This will provide the necessary flexibility in selecting ESMR base station locations and prevent "strike" applications from being filed to hinder ESMR service. Further, FCI seeks additional protections within the EGA. FCI requires a stable cochannel and adjacent channel environment within the EGA to prevent constant re-tuning of base station frequencies to protect and be protected from new and modified cochannel and adjacent channel stations. Therefore, FCI seeks to preclude new or modified non-ESMR cochannel or adjacent channel stations (except Public Safety stations) within the EGA. FCI further seeks authority to construct and modify ESMR base stations without prior Commission approval provided that the new or modified ESMR base stations do not require FAA approval or environmental processing under Section 1.1307.

36. Some stations in the 851-869 MHz band operate with "offset" frequencies, i.e. the channels are 12.5 kHz removed rather than the normal 25 kHz channel spacing. These stations do not fall into either the cochannel or adjacent channel interference analyses described above. For purposes of the capacity demonstrations described below, a 25 mile separation between ESMR stations and offset facilities has been assumed. Because of the relatively low height and power of the ESMR base stations, the greater potential for interference is to the ESMR service from the offset stations. The 25 mile separation utilized below is believed to be sufficient to allow interference-free ESMR and offset station operation. The effects of increasing or decreasing the 25 mile assumed offset separation, however, has little impact on the system capacities determined below. Furthermore, these offset stations only affect the system capacity determinations of the Los Angeles market.

37. As demonstrated above, ESMR service can be implemented without interference to existing SMR stations (or other 851-869 MHz stations). Furthermore, very conservative assumptions were used in the analysis above providing an extra interference buffer to existing stations and proposed ESMR stations. It is therefore believed that any actual interference experienced in the six congested markets from ESMR service will be limited to isolated cases. Because of the flexibility of the ESMR service, such isolated cases of interference can be resolved by utilizing a number of different techniques at the ESMR base station including changing frequencies, reducing power or height, re-orienting or changing directional antennas, or employing electrical or mechanical beam tilt.

VI. CAPACITY DETERMINATION

38. Based on the system design parameters discussed above, prototype system designs have been made for two proposed ESMR markets: Los Angeles and San Francisco. A database of Part 90 851-869 MHz facilities was

obtained from Comsearch on January 22, 1990[10]. A computer analysis was performed to determine the capacity of the prototype ESMR systems in these two markets. The actual analysis is available to the Commission upon request. The analysis is approximately 300 pages and therefore has not been routinely included.

39. Base stations locations for each market were selected from theoretical grids as described above. For Los Angeles a total of 151 base stations sites were utilized. For San Francisco, a total of 109 base station locations were utilized. Level 1 base station locations were selected to provide ESMR service within the EGA to areas where subscriber demand is expected. Level 2 and Level 3 base station locations were selected to increase subscriber capacity in areas where greatest demand is expected. The attached maps show a circle from each base station location representing a hypothetical service area. These maps are only intended to demonstrate the number of base station locations assumed for each market and to provide an approximate extent of potential ESMR coverage. In some cases, theoretical base station locations are just offshore or in other unsuitable areas for tower constructions. In these cases, actual base stations would, of course, be located as close as possible to the theoretical locations depending on the availability of real estate, zoning ordinances and other considerations.

40. Three 120° sector antennas were assumed at each base station location. Channel group assignments were made from the N=4 re-use plan, as discussed above. As a practical matter, channel borrowing, re-orientation of antennas, electrical and mechanical beam tilting of antennas, and power reductions will be necessary to tailor channel availability to meet subscriber demand across base station locations. For purposes of the system capacity determinations described below, some simplifying channel-use assumptions have been made.

41. To determine available frequencies, the computer program allowed all SMR frequencies licensed to FCI (also included were stations now managed by FCI that will be assigned to FCI and pending acquisitions by FCI) within the EGA. Therefore, initially any SMR frequency licensed to an FCI station within each respective EGA is available for assignment to an ESMR base station. For each prototype base station, the computer program limits the available frequencies to those channels within that base station's N=4 frequency group; i.e. Group A channels, Group B channels, Group C channels or Group D channels as described above. These frequencies are therefore, the channels which could be assigned to the particular base station if there were no other SMR (or adjacent channel 851-869 MHz stations) in the EGA. The first page of each computer analysis (available to the Commission upon request) is a summary page tabulating these FCI frequencies.

42. To account for interference protection to (and from) other facilities, the computer program then disallowed any frequencies for which

[10] Comsearch maintains a database of Part 90 licenses and applications. This database is maintained by updating the FCC's Master Frequency File on a daily basis. Comsearch receives the updates to the database directly from the FCC. Although no data source is completely free of errors, the Comsearch database is regarded as the most complete, accurate and up-to-date source for Part 90 data.

there were cochannel stations within 48 miles, offset cochannel stations within 25 miles or adjacent channel stations within 16 miles. Stations potentially involved in interference considerations were examined from an area larger than the EGA by a full degree in latitude and longitude on all sides. The remaining frequencies at each base station were thus those frequencies from the appropriate N=4 channel group licensed to a FCI station within the EGA that can be utilized without cochannel, offset cochannel or adjacent channel interference. The available frequencies were then subdivided into the appropriate 120° sector. Finally, a single analog frequency was subtracted from the sector with the most available channels to account for the effect of control channels on system capacity. The computer analyses list these frequencies for each sector in every prototype base station location for both Los Angeles and San Francisco.

43. The number of analog frequencies available in each sector was then multiplied by three to account for the 3 TDMA voice circuits available from each analog channel. The subscriber capacity was then determined for each sector of every base station location assuming a P02 (Poisson .02 blocking rate[11]) grade-of-service and 100 callseconds per subscriber in the busy hour. The capacity of every base station location is summarized in the computer analyses. The aggregate system capacities so determined were 220,332 for Los Angeles and 339,950 for San Francisco. These numbers represent the system capacities for interconnected mobiles.

44. The FCI currently licensed SMR systems within the Los Angeles EGA have a total of 28,147 licensed mobiles. The FCI currently licensed SMR systems within the San Francisco EGA have a total of 29,822 mobiles. The currently licensed mobile units include a mix of dispatch only customers, dispatch and interconnected customers and interconnected customers only with a large majority being dispatch only customers. The operational history of FCI is that the capacity for 1 interconnected mobile represents the capacity for 4 or 5 dispatch only mobiles[12]. If we assume that dispatch use accounts for 75% of the current SMR usage, the equivalent number of interconnected mobiles for Los Angeles and San Francisco are at most 12,314 and 13,047 respectively. Thus, the ESMR concept represents an 18 to 26 times capacity increase over current analog SMR capacity.

45. A traditional dispatch service requires a radio link for every mobile in the fleet for each dispatch. This requirement will reduce the ESMR system capacity somewhat. Customized dispatch services described above can, however, improve the efficiency of the ESMR dispatch service

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[11]The Poisson formula (also called the Molina formula) assumes a large number of independent call sources, a limited number of available trunks to service the calls and lost calls held. The Poisson formula is slightly more conservative than the Erlang B formula. The P02 grade-of-service is a common assumption for many telephony applications including cellular radio.

[12]The operational history of FCI indicates that on the average, an interconnected mobile communication is 7 times longer than a dispatch communication. However, because of the frequency of dispatch communications, the capacity for 1 interconnected mobile represents the capacity for 4 or 5 dispatch mobiles.

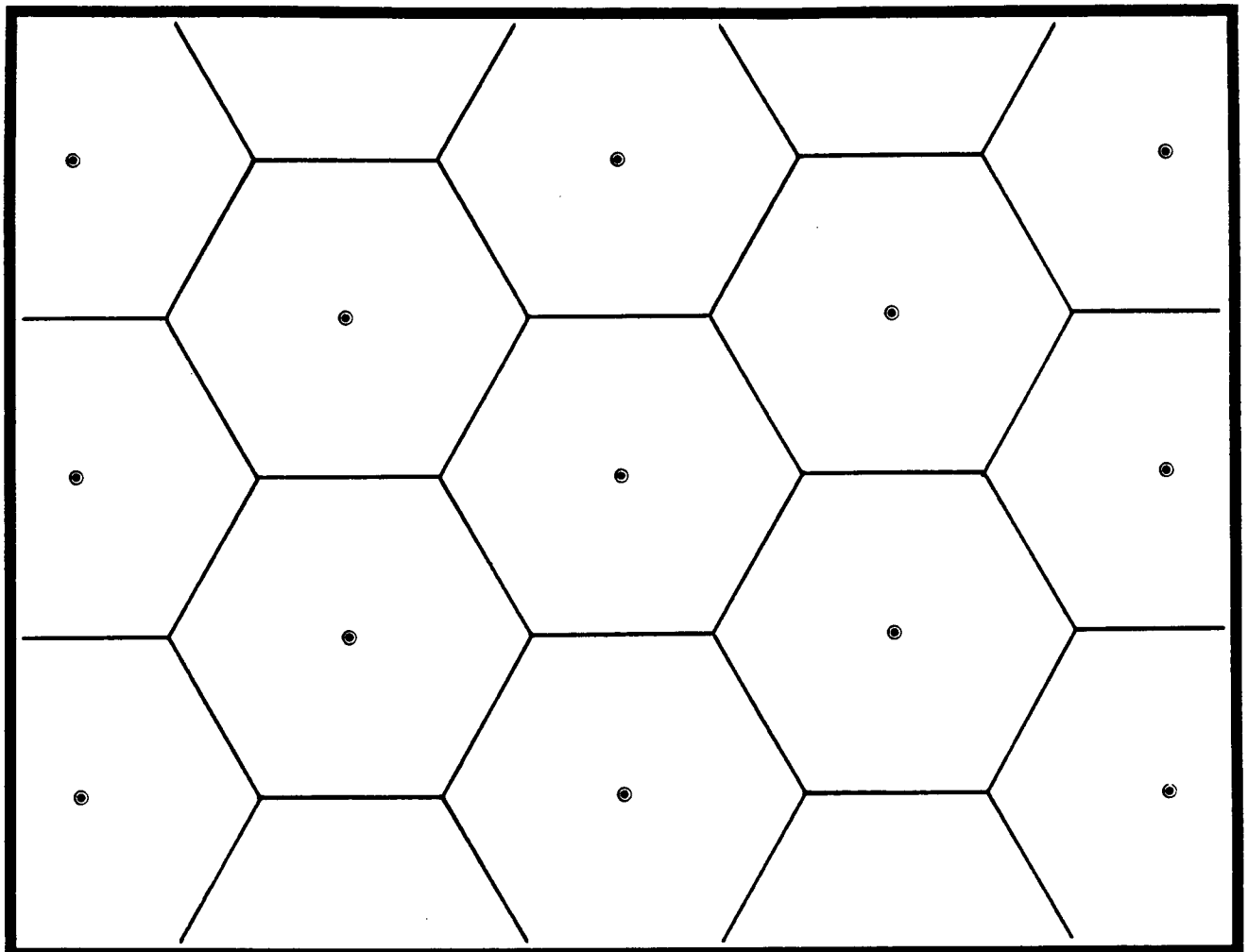
by reducing the number of mobiles requiring a forward (base station to mobile) radio link and reducing the number of mobiles requiring a reverse (mobile to base station) radio link. Because of the commitment of FCI to support traditional dispatch service as well as offer new dispatch services, FCI is conservatively claiming a fifteen fold increase in system capacity.

46. There are a number of 851-869 MHz entries in the Comsearch database without transmitter locations. It is believed that these entries represent statewide and countywide authorizations for Public Safety stations, some of which may be offset cochannel and adjacent channel to ESMR frequencies. FCI does not propose to preclude modifications to these important services within the EGA. Furthermore, FCI will take whatever steps are necessary to avoid interference to these stations including removing potentially interfering frequencies from the available ESMR channels if a significant interference potential exists.

47. The system capacities determined above are based on conservative assumptions about the capabilities of TDMA architecture. As discussed above, vocoder technology is advancing so rapidly that 4, 5 or 6 TDMA time slots should be available from every 25 kHz analog voice channel. The interference assumptions described above are also conservative in providing protection to existing SMR and other 851-869 MHz stations. In addition to the expectation of additional time slots per analog channel, FCI anticipates less stringent cochannel, offset cochannel and adjacent channel protection requirements allowing these channels to be re-used more often within the EGA. The net result of these expectations is system capacities far in excess of the fifteen fold increase conservatively proposed for ESMR.

VII. CONCLUSIONS

48. FCI proposes to utilize its SMR frequencies more efficiently. The ESMR concept will allow a fifteen fold increase in subscriber capacity without additional spectrum allocations or interference to existing 851-869 MHz users. The new technology will allow new features and services to be introduced to private land mobile communications not currently possible with the existing analog SMR systems. FCI's ESMR proposal can be implemented using currently available technologies and offers the flexibility to incorporate new advances to improve capacities and capabilities. ESMR represents the next generation in the SMR service for the six spectrally congested markets of Los Angeles, San Francisco, New York, Chicago, Dallas and Houston.



	DISTANCE BETWEEN CENTERS	RADIUS
LEVEL 1 HEXAGONALLY CLOSEST PACKED GRID	14 mi.	8.08 mi.

FIGURE 1

FLEET CALL, INC. ENHANCED SMR

THEORETICAL BASE STATION GRID

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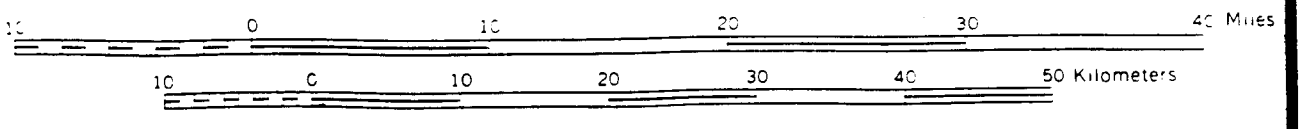
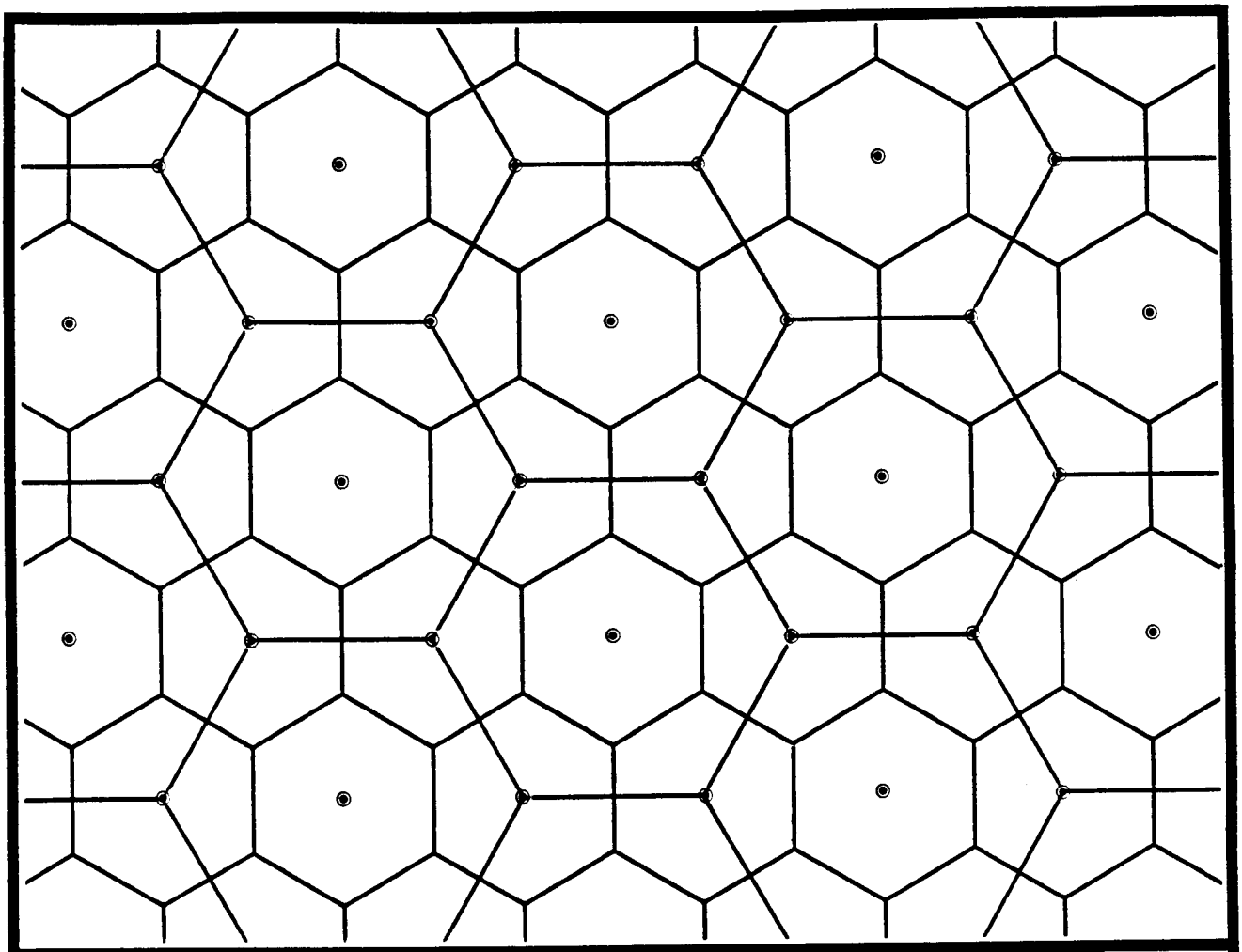




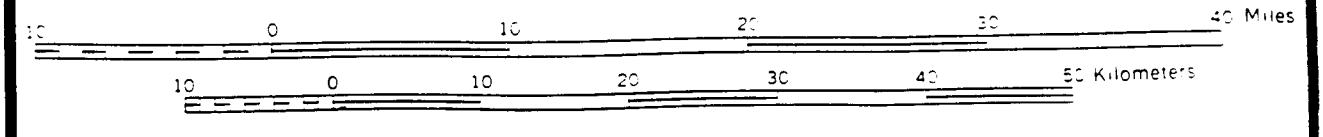
		DISTANCE BETWEEN CENTERS	RADIUS
LEVEL 1	HEXAGONALLY CLOSEST PACKED GRID	14 mi.	8.08 mi.
LEVEL 2	WITH PRIMARY 'CORNER SPLITTING'	8.08 mi.	4.67 mi.

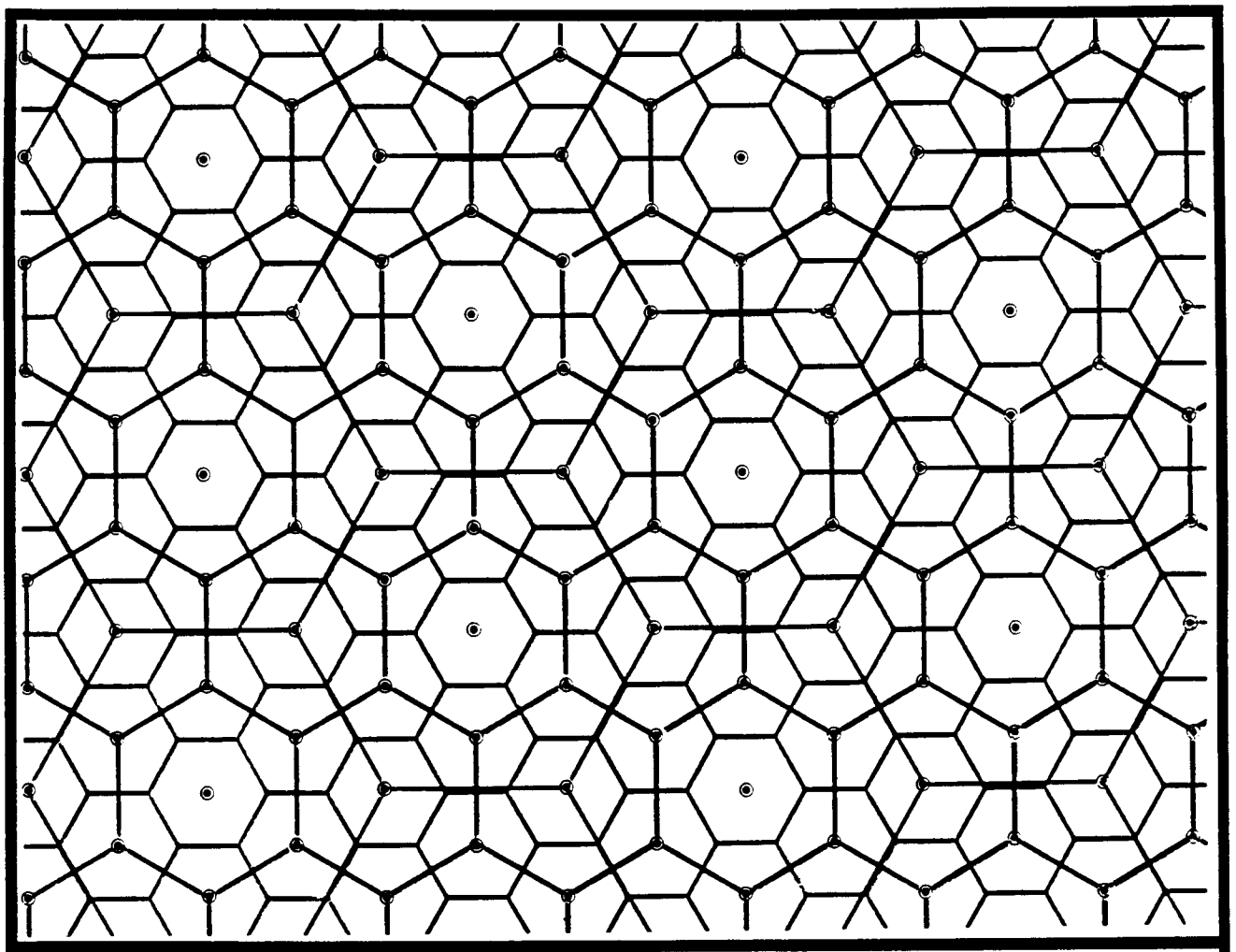
FIGURE 2

FLEET CALL, INC. ENHANCED SMR

THEORETICAL BASE STATION GRID

FEBRUARY 1990 MOFFET, LARSON & JOHNSON, INC.





		DISTANCE BETWEEN CENTERS	RADIUS
LEVEL 1	HEXAGONALLY CLOSEST PACKED GRID	14 mi.	8.08 mi.
LEVEL 2	WITH PRIMARY 'CORNER SPLITTING'	8.08 mi.	4.67 mi.
LEVEL 3	WITH SECONDARY 'CORNER SPLITTING'	4.67 mi.	2.69 mi.

FIGURE 3

FLEET CALL, INC. ENHANCED SMR

THEORETICAL BASE STATION GRID

FEBRUARY 1990 MOFFET, LARSON & JOHNSON, INC.

10 0 10 20 30 40 Miles

10 0 10 20 30 40 50 Kilometers